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THE SCOTTISH GEOGRAPHICAL MAGAZINE

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THE SCOTTISH GEOGRAPHICAL MAGAZINE

PUBLISHED BY THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY
PROFESSOR JAMES GEIKIE, LL.D., D.C.L., F.R.S., HON. EDITOR
MARION I. NEWBIGIN, D.Sc., ACTING EDITOR

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THE SCOTTISH

GEOGRAPHICAL

MAGAZINE.

THE REGIONAL POPULATION GROUPS OF ATACAMA.[1]

(With Sketch-Map.)

By Isaiah Bowman, Assistant Professor of Geography at Yale University.

Physiographic Features of the Desert of Atacama.[2]

The general physiographic description of the land forms of Atacama, their origin and stage of development, would form the subject of a separate article. Therefore only those physiographic features are discussed here which exercise an unusual influence upon the population groups of Atacama. These features or factors are primarily climatic, at least in their immediate effect, and only ultimately topographic. For while the topography of the Andes gives the climate its pronounced character, it is the climate and not the topography which is of immediate concern to the people. A second great physiographic factor and one whose operation is nowhere in the world more clearly illustrated

[1] Reprinted, in a slightly abbreviated form, from the *Bulletin of the American Geographical Society*, 1909.

[2] There is no single name for the west coast desert of South America. Portions of it are called the Desert of Atacama, the Pampa de Tamarugal, the Desert of Tarapacá, Tablazo de Ica, etc. Some generic term is badly needed. The phrases "the west coast desert of south America" or "the desert of Chile and Peru" are highly unsatisfactory. The former is cumbersome, the latter includes with the coast deserts the mountain and plateau deserts, which are of a totally different type. I propose that the most common term and the one which now includes the largest unit of this elongated desert be used to designate the whole. Few now use the word Atacama in the restricted and precise way in which it is used in Chile. A further slight extension of its meaning would supply the much-needed term. If at any time it is desired to use the word Atacama in its old restricted sense the phrase "The Desert of Atacama *in Chile*" might be taken as a reasonable substitute.

than in that portion of the west coast desert east of Iquique, and known as Tarapaca, is the space relations of the watercourses to each other, to the sea, and to the mountains; and hence the space relations of the population groups so intimately associated with them. These space relations, as will be seen in the closing paragraphs, at times overshadow every other factor, though they in turn rest upon topography and climate as fundamental causes—topography, as intensifying the aridity and rendering it excessive as compared with most of the other deserts of the world, as well as controlling the spacing of consequent streams; climate, as making agriculture, and indeed grazing, impossible beyond the influence of the life-giving streams, and thus throwing the whole burden of subsistence upon the watered areas, which are more or less isolated in horizontal space. Between the oases there is little to be gained and much to be lost in applying energy to the conquest of sheer space.

The west coast desert of South America is unique among the deserts of the world for its elongation. It stretches through 27 degrees of latitude, is over 1600 miles long, and but 50 to 100 miles wide, a narrow strip of bleak, inhospitable, rainless coast. In journeying southward from Panama one discovers it with startling suddenness. At Guayaquil one sails through wide, green, river lanes, bordered with tropical verdure; cattle graze on all the hills and flood-plain tracts within reach of the eye. A single night's journey southward by steamer and one catches sight of the tawny foreland of Talara, with its city of petroleum derricks, and a few hours later anchor is dropped at Payta, the chief port of north-western Peru. For the tropical foliage of the Guayas Valley at Guayaquil one has here only a few scattered drought-resisting bushes on a plain of yellow sand; for the great herds of cattle only meagre flocks of scrawny goats, and for the rivers and brooks of Ecuador only the dry watercourses of the wellnigh rainless coast desert of Peru.

The precise degree of rainlessness which one may ascribe to this coast desert is a matter difficult to determine. It is asserted by reliable residents that it rains but once in a ten- or twelve-year period, and that there is then no appreciable run-off.

In 1906 there was a three-days' "rain" at Iquique with a perceptible run-off. There were successive light showers with intervals of extremely heavy mist. On account of the heat the houses are built in very open style to permit free circulation of the air. Consequently, the rains and the mechanical collection of the penetrating mists mean the wholesale destruction of rugs, carpets, wall paper, and the like. It is impossible to keep out the moisture. The same disagreeable features are reported at Lima when the especially heavy mists of the winter season are driven in from the sea.

Sievers[1] records the yearly rainfall average for Copiapó, Chile, toward the lower end of the desert, in latitude 27° S., as 10 millimetres, or less than a half inch. At Payta, Peru, it is said to rain on an average about once every seven years. Frequently the published

[1] *Neue Mitteilungen* (1903), p. 62.

COLOMBIA
10° W Long.
Guayaquil
ECUADOR
Amazon River
Paytas
Piura
Catacaos
Sechura
Eten
Pacasmayo
Truxillo
Salaverry
BRAZIL
Madeira R.
10° S Lat.
Andes
Callao
Lima
Oroya R.
Ica
ICA
Lomas
L. Titicaca
BOLIVIA
Mollendo
La Paz
Oruro
Arica
Pisagua
Tarapaca
Iquique
Pica
Lagunas
Rio Loa
Quillagua
Tocopilla
Antofagasta
Atacama Desert
Copiapo
Huasco
Ballenar
Coquimbo
Tavrina
ARGENTINA
Conchali
Quilimari
Mt Aconcagua
Valparaiso
SANTIAGO
CHILE
Concepcion
DESERT ZONE
OF THE
PACIFIC COAST
OF
SOUTH AMERICA
SCALE OF MILES
100 50 0 100 200 300

accounts of these deserts ascribe to them a condition of utter rainlessness. Ball[1] compares the hard featured landscape of Tocopilla to that which an observer might see upon the moon, and suggests that those who feel curious as to the moon's appearance will be gratified by a view of this scenery. Borax drifts occur, for instance, on the spurs of the gorges at the back of Mollendo, and this is a substance so easily carried away by water as to make its presence in this form a safe indicator of a high degree of aridity. From an examination of the surface south-east of Arica there appears to have been no run-off due to local rain for hundreds if not thousands of years upon a tract several hundred square miles in extent. There is a complete absence in this particular locality of the slightest sign of running water. Considering Newell's[2] statement that "even so small an amount of rain as 0·1 inch will cause running water on lands denuded by excessive grazing" as authoritative, and as applicable to these undissected surfaces, the exceptional aridity of this desert is at once apparent.

Even at Payta and Copiapó, at the extremities of the desert, the rainfall is exceptionally large, and one must not take the rainfall conditions at these places as an indication of the general hyetal condition over the intervening 1500 miles of desert. The infrequent rains of Payta, at the northern end of the desert, are clearly due to the occasional migration of the equatorial rainbelt to a more southerly position than usual. This brings Payta within the extreme margin of the rainy tract, while the rainfall of Copiapó, at the southern end of the desert, is due to a similar exceptional position of the northerly margin of the belt of westerlies in their annual northward summer migration. The marginal disturbances of this rainy belt produce a light and uncertain rainfall as far north as Copiapó, where the phenomenon of a rainy day has been well described by Treutler.[3] Between these two extremes the climatic conditions are under the absolute dominance of the south-east trades and the lofty Andine Cordillera. This portion of the desert is in the wind shadow of lofty plateaus and mountains. The moisture which the winds bear from the Atlantic is precipitated upon the coastal margins of the mountains and tablelands of Brazil or upon the eastern slopes of the Andes. The winds, therefore, have a drying effect and desiccate in proportion to the height of the barrier mountains from which they descend. Since the Andes are the loftiest and most continuous mountain belt of tropical lands, and by their northerly trend they effectually shut off the rainfall of the easterly trades from the lands in their lee, it is easy to see that few, if any, of the tropical deserts of the world are so arid as that of the west coast of South America.

Up in the mountains the prevailing winds at night and during the forenoon are the trades and are in the south-east quadrant. Late in the afternoon a wind from the north west springs up which is always cold and raw. On the pampa at Lagunas the wind conditions are in a general

[1] "Notes on a Tour around South America," *Geographical Journal*, vol. iv. pp. 624-626.

[2] *Irrigation in the United States*, F. H. Newell, 1902, p. 45.

[3] *Fünfzehn Jahre* [illegible]. Part I. chap. xx., "Ein Regentag in Copiapó," pp. 135-136.

way similar. Between 1 and 3 P.M. a very sudden change occurs, the wind shifting to west or north-west, a change due to the indraught from the sea to the superheated land. At Santa Fé the change occurs at 3 P.M., but the wind almost invariably comes from the north and is called "the pampa wind." It is very hot in summer, and is always accompanied by great clouds of dust whirled several thousand feet aloft, giving the air a yellow tinge. Frequently the view of the distant Andes is completely shut out. At Lagunas the west wind of summer afternoons blows almost directly from the sea and is cool, but by the time it reaches Santa Fé it has traversed 70 miles of desert and is very hot and disagreeable. These winds gradually diminish in strength after the first blow, and die away late in the afternoon or at sunset.

The dust-laden atmosphere results in wonderful sky effects, the marvel of desert scenery. The painted skies of dusk are the great reward of the desert traveller. The peculiar yellow light of sunset at first gives its colour to all objects on the pampa and the distant mountains. As the sun sinks lower, the effects become magical; the plain darkens: only the distant hills receive light of whose changing colours the pampa dweller never tires. The yellow becomes orange, then magenta, and, finally, purple, and, above all, the majestic snow-clad peaks glow in the fading light like great diamonds set upon the purple hills.

At higher elevations, along the arid flanks of the western Andes which constitute the eastern border of the desert, rainfall occurs in appreciable but unascertained quantities; and in the southern winter, snow occurs at intervals of a few weeks as far down as 11,000 or 12,000 feet. The rains on these western mountain flanks occur at lower elevations, at 8500 feet, and from 20 to 70 miles from the sea, where a thin sprinkling of vegetation is to be found, which increases with altitude to a notable degree. Even down on the nitrate pampa, scattered and extremely light showers are occasionally experienced on the higher portions. At 3500 feet on the trail from central Lagunas to Pique, we noted indubitable evidence of recent run-off in the form of freshly outlined but then dry rills and recent alluvial fans not yet sun-cracked or concealed by the shifting sand near by. But such occurrences are to a high degree exceptional at this elevation.

In general, there is no vegetation whatever on the coast pampa, except where the mountain streams come down or when, as in exceptional years, great areas are flooded by the swollen upland streams which then discharge their waters far and wide. From the oasis of Monte la Solidad, 25 miles below Central Lagunas, to the oasis of Quillagua, in the valley of the Loa, 50 miles to the south, there is not the slightest sign of grass or shrub—a truly lifeless desert. Except for the scattered oases there is thus a virtual absence of vegetation of any sort from the 8500-feet level down to 1500-2000+feet. At the latter height another belt of vegetation appears, owing to the cloud bank that almost perpetually hangs like a pall over the common edge of land and sea. It is often 5-10 miles wide, and ranges in elevation from sea-level to over 2000 feet. The natives speak of it as the poncho (cloak) of the sea,

nightly drawn over its head. It is a persistent feature of the whole arid coast, and is explained by the contact of the warm wind of the land with the unusually cold waters of the Humboldt Current which sweeps northward nearly to the equator.

It is a feature of great scenic interest, especially if one obtains, as from above it, a view of the dark islands and promontories of land projecting through the white sea of fog. So constant is the bank of cloud, and so regular its position, that a thin belt of xerophilous shrubs occurs at this elevation and owes its existence to the mechanical collection of moisture upon the surface of the ground. The cloud particles adhere to the surface and to the plants, and are absorbed in some quantities by the earth, which is perceptibly moistened thereby. Evaporation from the ground is reduced not only by the shading effect of the cloud cover with respect to the sun's rays, but also by virtue of the high relative humidity its presence denotes. This feature was examined with much interest behind Mollendo, where numerous droves of donkeys and several herds of cattle were found subsisting upon the thin grasses and resinous shrubs whose range was clearly marked out on the mountain side. Above this level, as below it, is the naked desert. Darwin, on a trip across the coast ranges at the back of Iquique, noted the absolute lack of vegetation for 14 leagues, except for a few minute yellow lichens found growing upon the bleached bones of the mules' skeletons beside the trail.[1]

The nitrate pampa of northern Chile (3500+feet) lies at the intermediate level between 2000 and 8000 feet, where lifelessness is the rule. Everything needed in the nitrate business must be imported. There is no timber, no drinking water, no herbage for cattle, no wild animal life whatsoever. At Central Lagunas water is brought in pipe lines from Pique, 18 miles north-eastward; fruit from the oases of Pica and Matilla, 55 miles in the same direction; and fish from the sea at Iquique, 90 miles by rail. Except for these three slender resources locally supplied, all the food and clothing, the building material, machinery, work animals, labourers, everything must be drawn from more favoured lands. Here, as we shall see, is a condition common to many places along this naked coast, and one which constitutes the most important geographic influence in shaping the political fortunes of the region.

In contrast to these inhospitable conditions of the great intermediate areas of the coast desert, are the more favourable conditions which obtain at the northern and southern extremities, where the transition is made to the belt of equatorial rains on the one hand, and to the belt of westerlies on the other. These border lands are often the most attractive fields of study by virtue of the more varied and mixed responses of their denser populations. Their chief features will be noted here by way of contrast to the special qualities of Tarapacá.

The three typical population groups of Atacama discussed in the

[1] *A Naturalist's Journal of Researches into the Natural History and Geology of the Countries visited during the Voyage of H.M.S.* Beagle *Round the World*, London, ed. of 1890, p. 348.

following pages are not to be taken as the only types found there. There are at least two other types and a short series of sub-types. But the three chosen have a purer dependence upon natural conditions, and are perhaps the most interesting of all. At least one other type is of great importance—the valley type of the coast of Peru, south of Payta, where farms are cultivated by means of extensive irrigation, and where the staple products are sugar, tobacco, cotton, rice, fruits, cattle, and the like. Both their interior and exterior relationships are, however, controlled to a notable degree by political, social, and commercial factors of a different order of importance than those here treated.

The Payta and Piura Valley Region.

At the comparatively busy port of Payta, in north-western Peru, one finds an export trade in cotton, rice, and sugar; and the markets, in spite of the sterility of the immediate desert, are crowded with tropical fruits. As in so many cases along the coast of Peru, the busy port is but the reflection of a rich and distant hinterland where water from the mountains is directed to the service of man. Such is the relation of the forbidding region about the port of Lomas to the rich Lomas Valley, of Salaverry to Truxillo, and of Payta to Piura.

The best account of the Piura Valley (east of the port of Payta) yet written was published in 1895 by A. F. Sears.[1] He describes the tremendous burst of life that the inconstant rains bring to the thirsty land. For a week or a month, cattle and great herds of goats wander out of the irrigated valleys and revel in the fresh pastures on the plateau. What with their close grazing, and the increasing dryness, the desert soon reverts to its original condition. The brilliancy of this short, moist period is little short of marvellous. The red-petalled papita of San Juan decks the heretofore naked plain, and innumerable species of Oxalis, with many Crucifers and Amaranths, occur, living on the nourishment drawn by their long, penetrating roots. The algarroba (*Prosopis dulcis*), a stunted honey locust or mimosa, growing in the valleys, springs up on the plain, likewise the sapote del perro (sapodilla, *Achras sapota*), so called because the hungry dogs of the valley towns roam over the pampas in search of its fruit.

There is an interesting story current in Piura concerning a novel human response to these irregular rains. An enterprising cholo or half-breed built an inn in the middle of the desert, and furnished food and water to travellers, getting these supplies from the port twenty odd miles away. No sooner had he become well established than the owner of a distant hacienda demanded rent for the bit of desert land. The rent was paid perforce because the claimant had a grant from the Spanish crown by which it was shown that the hacienda extended toward the foothills of the Andes *as far as the goats could go before they returned to the river for water*; and it was known that every seven years the goats of this hacienda went far beyond the position of the inn before they returned to the River Chira!

[1] *Bulletin of the American Geographical Society*, vol. xxvii. No. 3, 1895.

The thorough wetting of the desert, about every seven years, results in five crops, two each year, and then the land rests until the end of the seven-year cycle, except in the valley bottoms where irrigation maintains the fertility of the soil.

When the floods are due the people ask every traveller from up valley where the river was when he passed. If he reports it coming, a crowd of eager listeners and questioners surround him as if he brought—as indeed he does bring—important news. As it approaches the upper haciendas the Indians turn out to welcome it with fife and drum and fire rockets. The news is passed around that the river is but a league away, and will be here to-day. The people ride out to meet it, and no fiesta in northern Peru is equal to the one on this occasion when the now tireless multitude goes out to seek the river. The affair reaches a climax when the river, at first a tiny rill, arrives at the bridge of Piura, where commonly 5000 people turn out to escort the river to the city. At the city of Catacaos (population 25,000, and the fifth city of Peru[1]), six miles lower down the valley, it is met by 15,000 people, so that the river has a triumphant march from the mountains to Sechura, where it enters the sea.

These eager inquiries for the river suggest those which are reported from Arabia. The infrequent thunder-storms of spring scatter their showers so irregularly that one place, a few miles square, may be abundantly watered while all the rest of the Arabian desert, for leagues around, may continue parched and lifeless. The shepherd searches for these watered places constantly, and every traveller who passes by is hailed for information as to the amount of the rain and the state of the pasture.[2]

The cotton of Piura is one of the most celebrated varieties in the world, and attempts to produce it elsewhere have resulted uniformly in failure. It has a long, woolly, and exceedingly tough fibre, and is distinctly the product of local climatic conditions, hence the inhabitants have a monopoly of its culture. The whole valley is largely given up to its production, for its market value is twice that of ordinary cotton. It is produced in twelve shades, ranging from a pure white through buff, pink, and light brown to a rich, dark red brown, and is used in the manufacture of fine underwear and hosiery, and in the adulteration of fine woollens as a protection against shrinking.

Besides cotton, some sugar and rice are produced for export, in especially large quantities after each seven-year rain. During a call at the port in September 1907, Chinese rice was being imported by a Japanese firm, in a British steamer, manned by a Japanese crew. The cheaper and inferior Chinese rice was imported for the labourers of the Piura Valley, and the superior crop of rice the inhabitants themselves had produced was exported to Chile and Europe, leaving a net profit, of considerable amount, for the hacienderos.

The borders of the mountain streams that cross the desert plateau

[1] Scherzer, *Land und Mittel-Amerika*, p. 446.
[2] Doughty, *Arabia Deserta*.

are lined with algarroba trees, and the cultivation of these is one of the special characteristics of the Piura Valley. During the dry season, when forage on the flood plain is limited or exhausted, the cattle, goats, and donkeys thrive upon its foliage and the long green pods it bears in incredible quantities. It even supplies food to the people. The trunks and branches and long thick roots of the dead algarroba-trees are burned for fuel. Charcoal is also manufactured from it in great quantities for export to Eten, Salaverry, Callao, and even Iquique, where it brings 40 to 50 cents. per quintal (100 lbs.). The goats, which hunt the desert for every scrap of succulent herbage and are herded in the valleys in great numbers, are chiefly a source of revenue for their skins. These are shipped out of the country for manufacture, and bring, in Peru, 40 to 50 cents. per pound. A goat skin weighs, on the average, about two or two and a half pounds.

The Piura is like the Nile in the relation it bears to its waiting people. The river rises once every year, and to exceptional heights once about every seven years. In times of unusual flood two crops may be produced even on the farther portions of the flood plain. The St. John's crop is harvested in August or September, and the Christmas crop late in December or early in January. The latter is but half or two-thirds the size of the former. The seed for it is planted in March, and as ten months are required for the growth and maturity of the crop, it matures during the drier portion of the year. In 1906 the river did not supply as much water as usual, and the Christmas crop was only about 2500 bales. There was a good overflow following the harvest, and the St. John's crop for 1907 was estimated at 30,000-40,000 bales.

(To be continued.)

THE PLANT LIFE OF THE ARIZONA DESERT.[1]

(With Illustrations).

WE noted here (cf. vol. xx. p. 605) the founding of the Desert Botanical Laboratory of the Carnegie Institution of Washington, in Arizona, and we have also recorded from time to time some of the results which the investigators of that laboratory have published. The receipt of the two pamphlets named below, however, affords an opportunity of considering more fully the many interesting facts which its workers are gathering together. By the kindness of Dr. MacDougal, we are able to reproduce some striking photographs of the conditions prevailing near the laboratory.

[1] *The Course of the Vegetative Seasons in Southern Arizona.* By D. T. MacDougal. Reprinted with revisions and corrections from *The Plant World*, 1908. Many illustrations.
Distribution and Movements of Desert Plants. By Volney M. Spalding. With contributions by other authors. Many illustrations. Washington: The Carnegie Institution, 1909.

Mr. Spalding's pamphlet is an elaborate monograph, running to 144 pages, and copiously illustrated both with photographs and with sketch-maps and diagrams. Dr. MacDougal's reprint is smaller, and written from a more general standpoint. We may therefore begin by giving a short account of its contents, omitting everything of purely botanical interest.

The author begins by pointing out that the Desert of Southern Arizona has probably had an arid climate since Pleistocene times, and that many of the plants now inhabiting it must have originated within the limits of the area. A peculiar feature of the scanty rainfall, and one that markedly distinguishes the region from the deserts of Egypt and Arabia, is the occurrence of two maxima of precipitation—a winter one and a summer one. Both of these determine periods of vegetative activity. As the region is one of considerable elevation, in parts at least, the winter fall may take the form of snow, which melts slowly in the hot sun. This results in a maximum absorption of moisture by the soil, a condition naturally favourable to plant life. The result is that as soon as the winter solstice is past, many plants show a marked awakening, which is only checked by the fact that radiation makes the nights cold, sometimes very cold, with as much as twelve degrees of frost. These cold nights, even when the temperature does not fall sufficiently low to produce blighting, make growth slower than it would otherwise be, so that even the precocious flowers do not open till February.

The plants which show winter activity may be classified in two groups—the perennials and the annuals. The perennials include such familiar genera as pentstemon, anemone, verbena, and so on. As the temperature rises with the approach of April and May, many of these winter perennials shed their leaves and pass into a quiescent state, from which they do not emerge till the following December or January, the whole period of their activity being comprised in about one hundred days. Remarkable as this may seem, it is, of course, paralleled in the Mediterranean region, where it is the winter rains which awaken many of the perennial plants. Indeed, very many of the plants called by gardeners "bulbs," in the large and liberal sense, are simply desert or steppe plants, whose winter or early spring flowering is explained by their desert origin. In Arizona some of the winter perennials retain the power of blooming at any period of the year when the rainfall permits, lying more or less dormant in the intervening periods of drought. Others do not die down nor shed their leaves, but such forms show the typical adaptations of desert plants, having their leaves or stems protected by a covering of varnish, or of hairs, or possessing other protective devices. Of these the creosote bush is a good example.

Among the numerous winter annuals are a wild carrot, a stork's bill, various plantains, the Mexican poppy (Eschscholtzia), and others. The remarkable feature of these plants is that they ripen their seeds in March or April but these seeds, though exposed both to the summer rains and to the summer heat, do not germinate till the following December—a fact of great interest. They are apparently refractory to

the influence of heat, but germinate after being exposed to the coolness of the autumn nights. The investigators at the laboratory found, however, that a judicious alternation of oven and refrigerator would induce them to germinate before their natural time—a result probably due to the effect of varying temperatures on the seed coat.

FIG. 1.—Giant cactus (*Cereus giganteus*) in flower. Note the desert vegetation surrounding the cactus (cf. Fig. 4).

With March the activities of the winter plants end, and April, May, and June constitute a period of high temperature and low precipitation, very unfavourable to plant life. This is the active period of the true desert forms, those distinguished by their spiny or succulent aspect. During the winter moist season these plants have been accumulating water either in their stems, *e.g.* cactuses, or in their spiny leaves, *e.g.* agaves, and the rising temperature permits them to form flowers from this store of water; the illustrations (Figs. 1, 3, 4) show some

of these, such as the great Giant Cactus (*Cereus giganteus*), so characteristic a feature of the desert, and one of the numerous Opuntias. It is at this period of the year also that most of the trees and shrubs flower.

With the end of June rain-clouds begin to appear on the mountain summits, and July and August usually see the heaviest rainfall of the year. The rains have a very marked effect upon certain plants and seeds which have lain dormant through the period of drought. Forty-eight hours, Dr. MacDougal tells us, is sometimes enough to alter the whole appearance of the landscape, millions of seedlings springing up under the influence of the moisture. Some of the winter perennials start again into activity, but more characteristic are such plants as the great Barrel Cactus (see Fig. 2) which now find the temperature high enough for flowering to take place. Some of the seeds of the spring-flowering perennials also germinate with the increased humidity of the soil. Very striking are the summer annuals, such as Euphorbias and sunflowers, which now spring into being, while a point of considerable economic interest is the effect of these summer rains in promoting the growth of grasses, which later form valuable food for grazing animals.

By September the precipitation greatly diminishes, and October and November are practically rainless. During this period vegetative activity practically ceases until the winter rains and the rising temperature after the solstice start the new cycle once more.

The whole sequence, it will be observed, affords a striking example not only of the close dependence of vegetation upon seasonal rainfall in arid regions, but also of the familiar, but too often forgotten fact, that the "seasons" of the cold temperate region are a phenomenon of relatively limited extension over the globe. In Southern Arizona it would be true to say that spring is summer, autumn winter, and winter spring—a pleasing paradox which we recommend to the notice of teachers.

We turn now to Mr. Spalding's monograph. It is in sum a detailed study of plant distribution within a limited area, the area chosen being Tumamoc Hill (Fig. 1), on the northern slope of which the Botanical Laboratory is placed. How detailed the survey is may be gathered from the fact that on some of the sketch maps the distribution of the *individual* specimens of the giant cactus is recorded. The points which directly interest the geographer, as geographer, may be summarised somewhat briefly.

The area chosen includes a part of the Santa Cruz river and its flood-plain, the long mesa-like slope rising from this plain to the mountains, and Tumamoc Hill itself. The region is a well-defined one, and its flora has been little altered by man's interference. The geographical features of each section, and the characteristic plant-associations of each, may be briefly considered.

The Santa Cruz river, like other streams of this part of the States, is seasonal in character, being dry for months at a time, and then becoming for a brief period a raging torrent. At all seasons, however, the water table is but little below the surface of the ground, and the banks of the river-bed are therefore lined with willows and "cottonwoods"

(Populus). Minor members of the association are arrow-weed and spiny aster. The special feature, however, and that apparently most closely associated with the arid conditions, is the poverty of species as contrasted with the flora of the banks of the perennial rivers of the Eastern States.

The flood-plain is a mile or less in width, and is covered by a deep, fine alluvium, of adobe-like texture, but very fertile under cultivation. The characteristic species is the mesquite (Prosopis), a tree or shrub belonging to the Pea-flower family, with markedly xerophytic characters.

FIG. 2.—Catclaw acacia (*A. greggii*) with mistletoe. The tree occurs with mesquite on the flood-plain and also on the "wash."

It is an interesting plant in its adaptation to two apparently inconsistent conditions. That is, while it shows all the ordinary characters of a desert plant—leathery leaves, spines, and so forth—yet its woody tissue carries much water, so that the roots must be liberally supplied. In point of fact, while the characters of its aerial parts enable it to withstand the dryness of the desert air, its enormous roots, which are fifty or sixty feet long and extend downwards a great depth, enable it to collect the necessary water from a vast area. It is widely distributed in the arid regions of the States, and appears to be extending its territory yearly. It is essentially an inhabitant of plains, though capable of extending upwards

to the hills, when, however, it becomes stunted and shrub-like. Associated with the mesquite on the flood-plain are some acacias, such as the "catclaw" acacia (Fig. 2), and other plants of minor importance.

On the flood-plain there are at intervals the so-called "salt-spots," varying in size from a few rods to many square miles, which have a special flora of their own, including chiefly "salt-bushes" (Chenopodiaceae). In the north-west of the area there is also a "wash," that is, a drainage area, which, though usually dry, gives, especially in its vegetation, indications that water is present below the surface. Such washes are of great interest because they afford a path by which the plants of the plain may invade the hills. Thus the mesquite occurs freely in this particular wash, and the creosote bush thrives much better here than on the adjacent slopes. Similarly, the plants of the higher regions of the hills, that is, of the moister parts of the region, find in these washes a means of extending their distribution downwards towards the plains. Such forms are usually shrubs or trees, and the net result is that the "wash" is indicated even at a distance by its fringe of arborescent vegetation.

From the flood-plain a mesa-like slope, at first gentle and afterwards steeper, ascends to the volcanic hill above. The slope is generally gravelly or sandy, with much "caliche"—a mixture of clay and carbonate of lime, which forms a kind of pan. The poor soil, the rapid run-off due to the slope, make the conditions here very unfavourable to plant life. The characteristic plant is the creosote bush (Larrea), which, though here dwarfed as compared with specimens found under more favourable conditions, manages to survive even under the most unfavourable circumstances. Among its special adaptations to desert conditions, its extensive root-system is noticeable, the roots both penetrate deeply and also branch widely near the surface, so as to draw water from as large an area as possible. With this dominant species others are associated, notably one of the prickly pears (*Opuntia fulgida*).

Above the slope favoured by the creosote bush is the hill proper, with many perennial plants, often varying with the exposure. The soil here is a heavy clay, but is often shallow, or even absent where the bare rock crops out at the surface (Fig. 3). It is at the same time very retentive of moisture. Among the chief plants are *Fouquieria splendens*, a spiny plant of the Tamarisk family; a whin-like plant, *Parkinsonia microphylla* by name; and giant cactus. The first two are fairly widely distributed over the hill region, though infrequent on the north side. The giant cactus, on the other hand, is predominantly a plant of the southern slopes. It is on the hill also that the winter and summer annuals spoken of above are most abundant. The winter forms favour the northern slopes; the reason seems to be that these plants are entirely dependent upon the moisture in the superficial layers of soil, and they find that the drying-out of these layers is less rapid where the exposure, or some overhanging rock, etc., gives protection from the direct rays of the sun.

The above account shows that in the region studied the plants are intimately related to the topographic features. A fuller analysis shows, however, that this is due to the intimate relation between the surface topography and the nature of the soil, the main points which determine

plant distribution in Southern Arizona being the water-content of the soil, the amount of alkali present, and the texture of the soil.

FIG. 3.—Desert vegetation on a hill surface with little soil. An Opuntia (*O. laevis*) in foreground; in background giant cactus, barrel cactus, the spiny Fouquieria, Parkinsonia, etc.

It is here, we think, that the geographer finds his justification for calling in the aid of the botanist. If—and all the recent botanical surveys

point in this direction—each type of soil, in any given latitude, has its

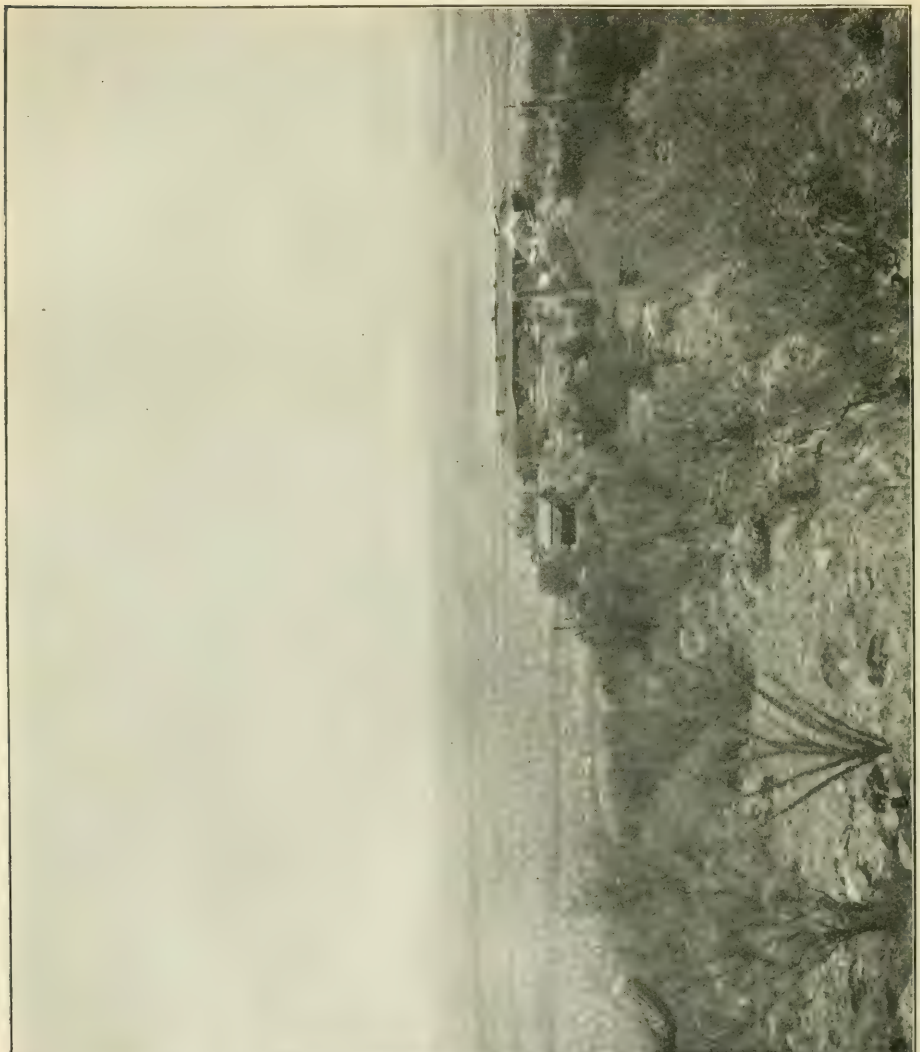


Fig. 4.—The Desert Botanical Laboratory on Tumamoc Hill. Note the giant cactuses, also the shrubs *Fouquieria splendens* and *Parkinsonia*

own plant association, easily recognised by the occurrence of one or more

dominant species, then surely the geographer is justified in including these associations in his descriptions of the topography. The point is of some interest, for Professor de Martonne has been criticised in some quarters for devoting a considerable part of his new *Traité de Géographie Physique* to Biogeography, the biogeographical chapters including a very full study of plant associations. This, says one critic, is not geography but botany. It is, indeed, highly probable that the most interesting results which the botanists have been publishing in the domain of plant distribution of recent years have led some geographers to encroach a little upon the botanist's proper sphere by taking over too many of these results, some of which certainly belong to the region of botany alone. At the same time, some of them are of so much value to the geographer that it seems preferable to err on the side of taking over too much than on that of taking too little.

Lest, however, the present writer be accused of gliding over the line into the realm of pure botany, it may be well to limit the account of Mr. Spalding's work to the brief summary given above. We may add, however, for the sake of the geographer with botanical tastes, that the paper contains a vast amount of material upon which we have not touched, and is an indication of the fine work which the Desert Botanical Laboratory is turning out.

CALEDONIA REDIVIVA.

By Marcel Hardy, D.Sc.

In approaching the question of land development, it is essential to possess all the geographical data which may help to guide and limit the activities of the constructive sciences. Sir H. Plunkett has recently summarised thus the threefold aspect of the work which is needed for a complete solution of the land question: *Better farming, better business,* and *better living.* For farming clearly has three sides: the first dealing with the cultivation of the soil, the breeding and feeding of stock; the second with the principles of farm-management, finance, and the economy of agricultural production and distribution: and the third with the social life of the agricultural classes. In each of these we can have most helpful relations with the sciences: in the first with natural science, in the second and third with economic, in which I include social science, and in all three with educational science.[1]

Clearly, then, geography may be helpful in indicating the possibilities and limitations of the soil, may throw light on the feeding of stock and the economics of agricultural production and distribution. The first step towards a policy of reconstruction is therefore to institute an inquiry into the natural resources of the land, actual and potential.[2] From this

[1] Presidential Address, Agricultural Section, British Association, 1908.

[2] At the beginning of the period of coal development an inventory of the mineral resources of the country was started, which subsequently developed into the Geological Survey. Now at the outset of a revival of the agricultural industries a similar census is needed, which should be carried out promptly if it is to be of any help.

geographical survey will gradually evolve the main features of a constructive scheme for treating the land, or *Geotechnics*.

Within that geographical framework sociology and economics will work out the human and immediately practical problems, and attend to the realisation of a comprehensive plan of work. It is only by the co-operation of the three sciences that a complete solution is possible.

Truly the difficulties are enormous. In the Highlands we have admittedly to deal with a region largely deserted, where everything has to be done, and inhabitants found for the land. But this is all the stronger reason for method in the work.

The first step, of course, would be to gather up and organise all existing data. In this respect it would be necessary to enlist the co-operation of the Meteorological Society and the Geological Survey. But, admirable as they are, the "Solid" geological maps of Scotland, even supplemented by the drift maps, cannot satisfy us. We want soil maps like the *Cartes Agronomiques* of France, or the Soil Survey of the U.S.A. Bureau of Agriculture. We have further a nucleus of the survey of the vegetation of Scotland, initiated in this country by Professor Geddes, and adapted from the French methods evolved by Professor Flahault of Montpellier. This unofficial survey has now developed into a Committee for the Survey and Study of British Vegetation, and is at about the same stage as was the Geological Survey at the beginning of the period of the development of the Coal. Several maps, due to private workers such as the late R. Smith, W. G. Smith, and the writer, have already been published. Others are in process of completion. As the spontaneous vegetation is the most complete and suggestive expression and index of the combination of natural circumstances which we call environment, clearly this survey is the basis on which further surveys should work, and therefore deserves to be encouraged and rendered permanent and official. A survey of the spontaneous fauna has yet to be undertaken, but, except in the case of pests and diseases, this would be of a more limited practical import.

As regards agriculture, grazing, and forestry, we must not neglect the valuable collections of memoirs due to the Highland and Agricultural Society and to the Royal Scottish Arboricultural Society. These results should now be digested, classified, and synthetised. A priceless collection of information is also to be found in the Old and New Statistical Accounts of the Parishes of Scotland. This information, often extremely careful and well presented, should be sifted, classified, and filed in any geotechnic library.

We thus come to the most important element of the case from a social point of view, viz. the relations of the rural regions to their centres or ganglions, the villages and cities. The disturbance of the natural and harmonious balance between these, in the opinion of Sir H. Plunkett, is a grave symptom of social and economic disease. In this connection the Statistical Accounts of the parishes should on no account be lost sight of. The modern forms of town surveys as carried out in London by Charles Booth, in York by R. S. Rowntree, in Manchester by Marr, and in Dundee by Miss Walker, ought to be more widely known and encouraged.

Studies in regionalism are now actively carried out in France with the greatest success, and prove most profitable in that they define the individuality of each region and show it as a complete, harmonious, organic unit, and determine its possibilities and limitations, and its relations to adjacent units. In Celtic Scotland, surely such names as Ardnamurchan, Moidart, Morar, etc., or again, Benderloch, Lorne, Lochaber, Argyll, Cowall, Badenoch, and others, are not merely dead and vague divisions. Looking at them closely but synthetically, one may venture to predict that they each represent and suggest specific types of landscape and vegetation, and connote true historical and social organic units, compared with which the actual administrative divisions are rude, clumsy, and meaningless. In this order of studies the geotechnic and sociological laboratory which Professor P. Geddes has started in one of the rooms of the University of London brings forward the relations, geographic and sociological, between town and country, and deserves close study.

Having thus collected and classified all available data, we may rapidly survey the different zones into which Northern Scotland naturally falls, and thus show the scope and bearing of a comprehensive geographic survey.

A most admirable and practical piece of work has been carried on for the fishing population along the coast-line, in the survey of the North Sea under the stimulus and supervision of Professor D'Arcy W. Thompson. Cannot we take this as an example of the advantages which would accrue from a systematic survey of the land? This again at once suggests the application and extension of a similar piece of work to inland fisheries, with a methodical and complete survey of rivers, lochs, and ponds, in respect of their actual and potential fish population. No more useful and practical supplement could be suggested to the Loch Survey of Scotland of Sir John Murray and Mr. Laurence Pullar. This would include a systematic study of existing fish, their requirements in the matter of water, food, light, hatcheries; their habits and modes of life, the methods of re-stocking and breeding. Experimental stations might be started, and surely there is no obvious reason why a country so richly gifted by Nature in that connection should not make of its inland fisheries an important industry. Cannot we compete with the canneries of British Columbia?

Outside ports and rivers the coast-line offers in many points sand dunes, some of which are still increasing, and seeing the success of Tentsmuir on the Tay in respect of its spontaneous reafforestation by Scotch Pine, we could do no better than follow the lead of France Germany, Denmark, and even Chile, and inquire into the possibilities of tree-planting (Maritime and Scotch Pine), and dune binding by economic grasses, or by those which, like the Italian rye grass, yield good hay. Neither should we neglect to inquire, experimentally and systematically, into the capacity of these coast sands, when fertilised with sea-weed or even with nitrifying preparations, for the cultivation of early potatoes, carrots, lupine, etc. . . . Is the question of sewage farms finally closed after the experiment of Craigentinny? Again, what do we know of the

possible utilisation of the fixed dunes now under heath, bracken, whin, broom, or forming links? The presence of broom, whin, and other leguminous herbs and bushes suggests that more profitable and equally hardy fodder grasses and herbs, as well as other food-plants, might be grown.

Passing inland to the broken belt of the carses, which enjoy a particularly favourable situation near markets, there is absolutely nothing either in the mode of formation, soil, or climate, or in vegetation and economic potentiality to distinguish them from the Lowlands of Holland and the Polders of Flanders, or the Fens of East Anglia. There is therefore no reason why they should not share in the prosperity of these. The only difference is one of cultivation, and comparing our carses with an equal area in Flanders, it must be admitted that they could be made to support comfortably a much denser population.

Here a striking query suggests itself: How is it that the admirable and most profitable initiative of the Drummonds of the Carse of Stirling in removing the blanket of peat in that carse has never been followed up and brought to completion? How is it that a vast waste like the Moss of Flanders remains to this day when it has been demonstrated that it is an economically and socially sound investment, and was no impossible task even with the clumsy devices at hand a hundred years ago, to remove the peat and reclaim a rich country for agriculture, and that at the very door of important cities? How is it that we see there a state of affairs exactly like that which the wild, starving, and half-naked Grahame caterans saw; or again, like that of the Fens at the time of the Berserkers, or of Flanders at the time of Julius Cæsar? This surely needs no survey to remedy.

Let us pass now to the lowland agricultural zone, which extends around the Highlands from the Tay to Inverness, and recurs in Caithness. We may notice all stages of development, from the era of greatest extension of peat which followed upon the wholesale disforestation, to the most prosperous agriculture our northern countries have ever known. The desolate plains of Caithness and Sutherland represent the primitive state of untouched peat bogs. A step forward was made a hundred years ago when Sir John Sinclair took the initiative of removing the peat, and revealed under that barren layer a rich area of red sandstone. But it must be admitted that little or nothing has been done since Sir John's time to reclaim the rest of the red sandstone, and far less to reclaim the area of older rocks lying to the west. The region of Elgin, Banff, Aberdeen and Kincardine, which in the times of the Statistical Accounts was largely under peat, has been reclaimed and well cultivated. Yet islands of peat still remain to this day, and other moorland tracts have not been properly drained. There is no physical reason why they should not be brought under cultivation. They seem to be carefully kept as reserves for the last survivors of the curious but degraded peat population, with their extraordinarily primitive mode of culture and life, hardly above those of the miserable serfs of the feudal ages, but of absorbing interest to the sociologist.

As regards the gneissic tracts of Caithness and Sutherland, no doubt

these, covered as they are with glacial deposits, offer but an unpromising field to human activity. Yet can nothing be done with that part of the country? Germany has been treating a similar problem on the vast heaths and marshes of its northern plain, and a great deal of information could be had from the "Moorkulturanstalt," which has been steadily at work for many years, and has already achieved some excellent results. In any case, if we are not in a position to tackle the problem scientifically and generously, like the Germans and the Danes, we might at least borrow some of the results of their work. Now, when there exist excellent methods like that of Dr. Ekenberg, of drying and completely utilising peat, even the peat may become a valuable asset, and this applies also to the vast peat deposits of the Highlands. After the removal of the peat, it then would behove us to study how far these rolling lowlands could be utilised at least as grazing grounds, perhaps even as forest grounds.

We do not know enough yet of the excellent work carried on in Norway, and to a small extent in Alaska, in regard to the study of northern agriculture and northern market-gardening. Neither do we know anything of the creeping espalier-orchards of North America, and thus the latent resources of these now desolate tracts are yet unknown to us. Here, again, surely we might imitate if we are not able to initiate research for ourselves.

Penetrating now into the Highlands proper, our survey finds an immense field for useful work. We want a classification of land suitable for grass, timber, and agriculture, graphically expressed as on the maps of classification of timber lands published by the Geological Survey of the U.S.A. There should be first a static presentment of the actual facts, a classification into peat moors, marshy grass moors, and good mountain pastures, into heather and alpine moors and pastures. We want to know what plants grow in each region, and what their feeding value is. In this survey the researches of the Highland and Agricultural Society will be found invaluable. But we need at once a more dynamic and suggestive survey, indicating not merely the actual state of affairs, but the causes of it in the past as far as these can be ascertained, from the intrinsic evidence afforded by the plant carpet itself. We require to know what areas, by drainage, manuring, or irrigation could be transformed into useful ground so as to repay the expense. We know well enough that good pasture may be improved or exhausted or otherwise deteriorated according to the nature and quantity of the grazing animals we put upon it. We know that large areas of once good cattle grounds have deteriorated since the introduction of sheep, or since their transformation into deer forests. Aiming at a maximum productivity of the ground, we therefore need to know what kind of treatment should be granted to each particular pasture ground; to find out what are its limitations, whether cattle ground, or deer ground; what sort and amount of labour should be spent in each instance, with an approximate idea of the cost and possible subsequent return. Carrying this one step further, our map should indicate the quantity of cattle, horses, sheep, or deer per acre each individual tract is capable of supporting;

whether for breeding, fattening, wool, or dairy purposes; and whether new kinds of grasses cannot be introduced. We may be able to draw upon the floras of similar regions such as South Alaska and British Columbia, Newfoundland, etc.

A corresponding survey should be conducted into the proper kinds of live stock: whether for dairying, meat, wool or breeding; what desiderata suggest themselves for the different zones and districts, so as to guide the breeders in their improvements and to call their attention to the specific qualities of ponies, sheep, and cattle from Alaska or Tibet.

But, admittedly, forestry should play an important part in the resurrection of the Highlands. Into the matter of the advantages that would accrue to the country not only in the timber and other wood industries, but in the question of improvement of slopes, water-supply, improvement of pastures, etc., etc., we cannot enter now. The positive demonstration has been made again and again over the continent, and the negative all over the world. We now need a survey of the possible timber area, similar to that of the Geological Survey of the U.S.A. But here we have everything to do, and since information from the scattered vestiges of forests and the timid plantations is quite inadequate, our botanical survey should be here a safe guide; it is, at least, the only one we possess. It should read the possible limits of hard wood and soft wood, not so much from the actual facts as from the vegetation itself, paying attention to the lesson that deforestation brings down the upper limits of the various altitudinal zones of vegetation. Again, the climatic indications of the moister West Highlands, suitable for spruce and other damp-loving, heavy species, *versus* the drier east, more suitable for pines and other lighter species, should not be neglected (cf. the writer's *La Végétation des Highlands d'Ecosse*). We must not forget that Scotland was too early separated from the neighbouring countries to receive her full complement of eastern and southern species.

We must thus supplement these deficiencies and draw with discrimination for the moist west upon South Alaska and British Columbia, perhaps upon Tasmania, South Chile, and nearer at hand upon Norway; for the lighter and drier east we have the flora of the North-Eastern States, Canada, and Newfoundland, as well as that of Siberia. Experimental arboreta should be started in that connection in the east and in the west. Surely there is enough variety in the idiosyncrasies of the numerous species to suit the various commercial requirements and all the different localities to be found in the Highlands. A sharp look-out should be kept from the outset on new diseases, so as to avoid repeating the disasters which befell the larch plantations. Attention should be paid to the question of destructive storms and to suitable modes of planting.

Similarly our survey should probe the soil and subsoil for the moorpan which proves such a formidable enemy to afforestation in Germany and Denmark. The West Highlands, as was shown by the writer, has little to fear from moorpan on account both of its slopes and its abundant rainfall. But the drier east is part of the same region as Germany and Denmark, and may conceal a layer of hard pan under its covering of heather. One of the inquiries, therefore, when it comes to

marking timber-soils, should be about the moorpan. It is a hopeful sign, however, that all the large attempts at replanting, whether on the Tay, the Dee, or the Spey, have succeeded beyond expectation.

The survey should also indicate what kind and amount of work is to be done in each individual instance as a preparation to replanting, giving a rough estimate of expenses and the possible return in course of time. The map, then, will show a classification of the timber lands according to the amount of timber per acre they are expected to support.

Ultimately such areas should be set apart as will most aptly serve as forest reserves and national parks, either for municipalities or the State, on grounds of public utility or amenity, for protecting the water-supply, regenerating slopes, or, again, for the prevention of floods, etc. Similarly, reserves are needed for the animal population, including fish.

Intimately connected with the forest survey—nay, part of it, is the question of the utilisation of heather moors. We know that through the destruction of forests, and the fatal habit of heath-burning, heath has encroached immensely alike on forest grounds and on pastures. This has been demonstrated over and over again in Switzerland and in France. When we have deducted the grazing and forest areas, there remains a certain area of heath which may be utilised otherwise. Attention should be drawn to the cultivation of the large-fruited cranberry, which in Eastern Canada and the North-Eastern Highlands of the United States yields such good results. Perhaps some other similar berry may also be found that can accommodate itself to heather lands. What remains then of untractable heath moors is the legitimate domain of the grouse, the deer, the eagle, and the wild cat.

The large peat areas may now be of economic value, since satisfactory processes have been discovered for converting peat into good fuel and bye products. Such bogs as those of Lorne, Rannoch, and Sutherland may then become useful, at least temporarily: the reclaimed lands may prove suitable for grazing, or even forestry, if proper measures be taken to drain them.[1]

As regards alpine pastures and their corresponding summer settlements, of which tradition in the West keeps such loving and poetic memories, their revival is an obvious duty, if only on eugenic grounds.

In one respect, unquestionably, the Scottish Highlands are extremely favoured: I refer to water-power. Deprived of huge falls developing millions of horse-power, Scotland has its power regularly distributed in small but permanent and steady quantities all over the country. No better arrangement could be found, in fact, to keep out large industries, and encourage the development of small industries, whether dairying, textile, or lighting; this ought to be an immense help to rural life in the Highlands. In America, surely, every little village and glen would be lit with electricity. It is sad to reflect that here we do not even know what power we possess.

[1] May we plead here that such peat bogs be not destroyed before they have revealed to expert eyes like those of Mr. F. J. Lewis the secret of the history of Scotland since the glacial ages? To destroy these archæological treasures without calling in experts to read their message would be an irremediable loss. The Geological Congress next year at Stockholm will be devoted to this question.

One of the first duties, then, should be the establishment of a survey of rivers and lochs from the point of view of water-power, as has been done in Finland. Now when we possess a survey of the lochs, it will be easily brought to a practical conclusion alike by the survey of water-power, by that of inland fisheries and of the floating capacity of rivers. It sounds almost incredible that Scotland should possess in her lochs huge power reserves hanging hundreds of feet above sea-level, and that absolutely no advantage be taken of them in a country which is alleged to be useless! Nor is it necessary, with our modern means, to interfere to any extent with the romantic beauty of the glens, as in the case of the falls of Fochabers.

Perhaps, also, means will be soon found to harness the winds either on the summits or on the west coast. To supplement the survey, a number of systematic experimental stations, agricultural, pastoral, forestry and fishing, as well as mountain and alpine gardens, are needed. But in this again we only need to follow the lead of other countries where such institutions, whether private or official, are liberally supported.

But where is the population to work those wonders? Surely our few thousands of crofters are not an unpromising material wherewith to constitute the nucleus of such a population! Degenerate though they be as a class, the latent qualities of the original clansmen, woodmen, and shepherds still reveal themselves strikingly in individual cases: and we know only too well that, crushed, trampled on, transported as they have been, few populations, whatever their original qualities, would have emerged better out of the ordeal. If the present generation then be unfit, let us turn our attention to the growing generations and give them a chance of recovering their former vitality, see what changes congenial occupations and surroundings can work along with a proper education.

We also know what they have been in the past. Almost every glen has its memories of a better time when it was lined with cottages and fairly stocked with a poor but not miserable population. Who knows what they might have achieved had they been encouraged by peace like the Swiss? In any case they would now find vast resources like modern forestry, modern dairying, helped by water power, grazing and fisheries and many other industries for which they are still eminently suited. To the sociologist belongs the task of devising means for counterbalancing the fatal attraction of the large, "tentacular" towns, and offering the rusties an adequate share of the spiritual potentialities of city life.

Lovers of Nature will surely sigh at this programme of strenuous activity, and regret the beauty of the purple-clad slopes, the changeful russet of the dying bracken, or the shimmering brown of the bogs spotted with deep blue or dark lochans. But he will find comfort in the thought of majestic timber-clad slopes, and the prosperous green pastures enlivened by our beautiful cattle, and dotted with picturesque cottages, where peace and comfort dwell. He will bear in mind that what he is looking at and admiring is not virgin Nature, but Nature ruined by man. There will be enough ground left for grouse and deer. Neither need he fear that the enhanced and varied beauty of the

Highlands will stay the influx of tourists. It is proposed to reafforest in Vermont and Maine precisely in view of the tourists.

Such are, briefly sketched, a few among the possible lines of a bio-geographical inquiry. No doubt others, and in greater number, would suggest themselves in course of a comprehensive and methodical survey. Geography alone can give coherence, unity, and guidance in this preliminary study. We therefore plead that it is her duty to step from a purely passive attitude into an active, guiding, and suggestive leadership. Never surely has Geography had a better opportunity of proving her practical usefulness than at present, when the whole adjustment of man to his surroundings is being reconsidered.

THE GEORGIAN BAY SHIP CANAL.

By Martin C. Comrie, M.A.

(With Sketch-Map.)

A recent Report[1] gives some interesting particulars with regard to this great project which has long been before the public. The proposed Georgian Bay Ship Canal is essentially a river and lake canalisation scheme, and would utilise natural waterways, which fortunately exist almost in a continuous line from Georgian Bay on Lake Huron to Montreal, the most inland and most important of the Canadian ocean ports. A straight line drawn through Montreal and Sault St. Marie has a direction almost due east and west, and follows closely the Ottawa River and Lake Nipissing, which thus furnish the most direct and shortest route from Lake Superior to a seaport. This route, if it can be made navigable for large lake freighters, appears to be the natural outlet for all the commerce of the West seeking transport through Lakes Superior and Michigan to the nearest ocean port.

The distance between Georgian Bay and Montreal by the proposed route is 440 miles, of which from 410 to 420 miles follows the course of some river or lake. From Georgian Bay to the water-parting between the Ottawa River and the Great Lakes, a distance of 81 miles, the canal would follow the channels formed by the Pickerel and French Rivers, and Lake Nipissing. The French River system enters Georgian Bay by three openings. For 6 miles the waterway would be coincident with the middle channel, on which French village is situated. Then, after passing through the main channel of the French River, the canal would proceed by way of that part of the French River waters known as the Pickerel River as far as the east side of Cantin Island. A sharp turn north would then be made to rejoin the main channel of the French River, which would direct the route as far as Lake Nipissing.

[1] *Georgian Ship Canal.* (1) Report upon Survey, with Plans and Estimates of Cost 1903. (2) Typical Views on the Projected Route. (3) Three volumes of plates accompanying report. Ottawa: Department of Public Works, Canada, 1903. [illegible]

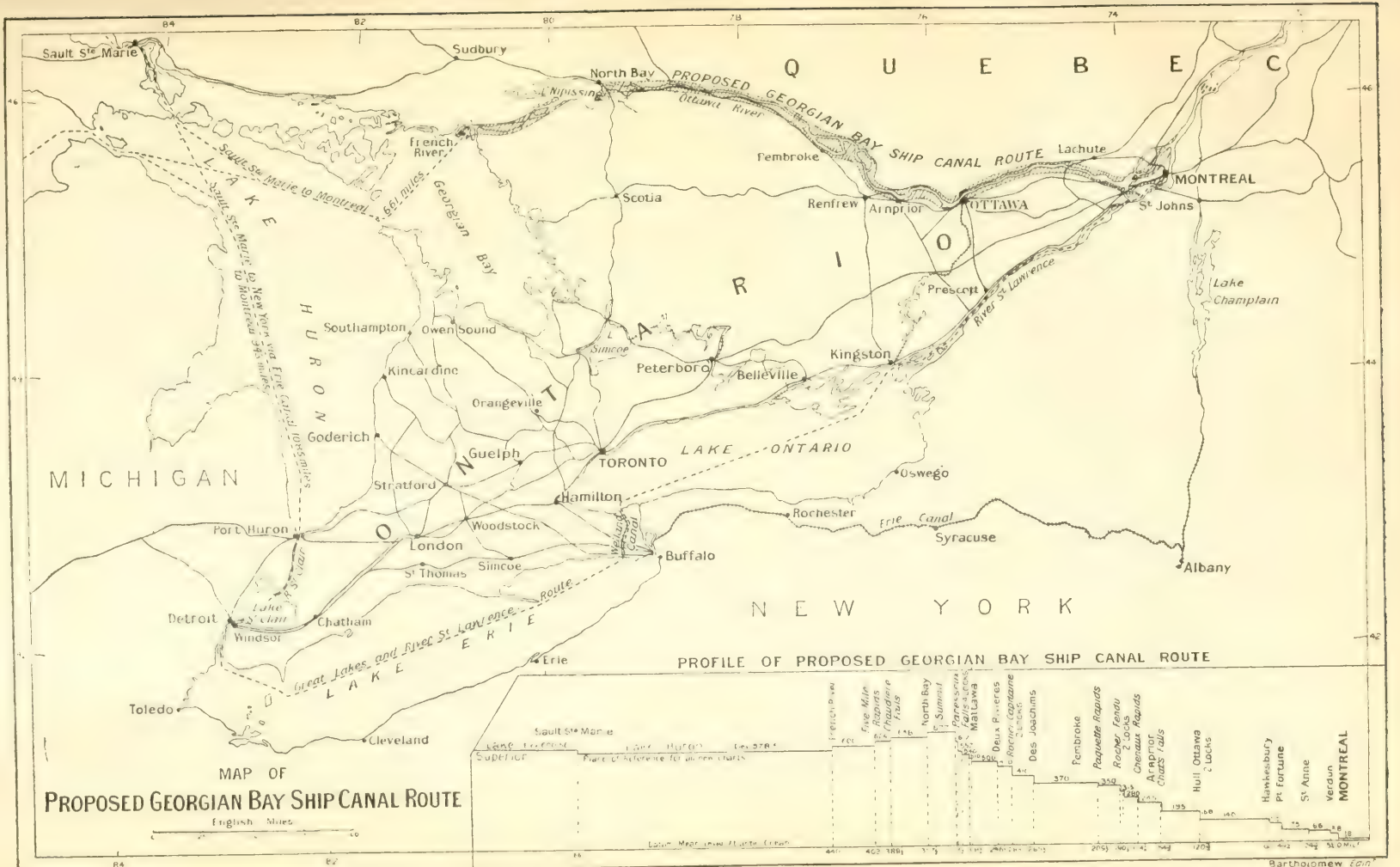
From Lake Nipissing, through the highest level on the route, it is proposed to construct an artificial waterway for 3½ miles, with the exception of stretches covered by a few small lakes. This artificial channel would lead into Trout Lake, thence into Turtle Lake, the Little Mattawa River, and Talon Lake, which would be used as far as Sand Bay at the eastern end, a distance altogether of 21 miles. From Sand Bay there would be a canal for 3 miles to the Mattawa River, which would be utilised as far as the town of Mattawa, a distance of 13 miles, where another canal-cut, ¾ mile in length, would make an entrance into the Ottawa River. This river, which expands into large and deep lakes in many places, would be followed all the way down to the foot of the Lake of Two Mountains, a distance of 293 miles. From the foot of the Lake of Two Mountains to Montreal, a distance of 25 miles, either the St. Lawrence River or a branch of the Ottawa River, called Rivière des Prairies, flowing north of the Island of Montreal, may be utilised. The former route would involve 5 miles of artificial waterway, and the latter about 11 miles. By the first route the canal would enter Montreal Harbour at its upper end, by the second the St. Lawrence ship channel would be joined at Bout de l'Ile, some 11 miles below the eastern boundary of Montreal Harbour, or 17 miles below the city custom-house.

For the whole route the aggregate length of purely artificial waterways would be astonishingly small, being estimated at 28 miles. Apart from these, about 80 miles of lake and river beds would require to be improved by dredging or excavation, leaving 332 miles of natural waterways, wider than 300 feet, and over 22 feet in depth, not requiring any improvement.

At the outlet of the French River is French Village harbour. The river has an average width of 500 feet, with a depth of about 30 feet of water. Outside, the Bustard Islands, about 3 miles distant from the mouth of the harbour, offer good protection against southerly winds, which are sometimes of considerable violence.

The project of canal navigation is on such a scale as would accommodate the largest lake steamers in the carrying trade. The tendency in regard to lake freighter construction is to increase the length and beam, the draft being practically limited to 19 or 20 feet. This condition of a fixed draft is imposed by the limit of depth in the artificial channels connecting the Great Lakes—the St. Mary's River, St. Clair River, Lake St. Clair, and the Detroit River, where the depth varies from 20 to 22 feet. The depth on the sills and in the reaches of the proposed waterway has been fixed at a minimum of 22 feet.

The locks estimated for are 650 feet in length and 65 feet in width, thus allowing for a reasonable increase in the size of the boats. It has been determined that the width of channels would have to be at least 300 feet in submerged cuts, and a minimum of 200 feet in canal cuts. The number of locks required for the project as designed would be 27 for the route entering Montreal by way of Ste. Anne and Lake St. Louis, while by the Rivière des Prairies route it would be 26. The lift of these locks would vary from 5 to 50 feet,


Sault Ste Marie
Sudbury
North Bay
PROPOSED GEORGIAN BAY SHIP CANAL ROUTE
Ottawa River
Q U E B E C
French River
Pembroke
Lachute
MONTREAL
Scotia
Renfrew
Arnprior
OTTAWA
St Johns
Sault Ste Marie to Montreal 695 miles
Georgian Bay
L A K E
H U R O N
O N T A R I O
Prescott
River St Lawrence
Lake Champlain
Southampton
Owen Sound
Simcoe
Kincardine
Peterboro
Belleville
Kingston
Orangeville
Goderich
Guelph
TORONTO
LAKE ONTARIO
MICHIGAN
Stratford
Hamilton
Oswego
Rochester
Erie Canal
Syracuse
Albany
Port Huron
Woodstock
London
Welland Canal
Buffalo
St Thomas
Simcoe
St Clair
Lake St Clair
Detroit
Windsor
Chatham
Route
N E W Y O R K
Great Lakes and River St Lawrence
L A K E
E R I E
Erie
Toledo
Cleveland
MAP OF
PROPOSED GEORGIAN BAY SHIP CANAL ROUTE
English Miles
PROFILE OF PROPOSED GEORGIAN BAY SHIP CANAL ROUTE
Sault Ste Marie
Lake Superior
Lake Huron
French River
Five Mile Rapids
Ile Chaudiere Falls
North Bay
Summit
Pembroke
Paquette Rapids
Rocher Fendu 2 Locks
Chenaux Rapids
Arnprior
Chats Falls
Hull
Ottawa 2 Locks
Hawkesbury
Pt Fortune
St Anne
Verdun
MONTREAL
Bartholomew Edin

and would overcome a difference of elevation from Montreal to summit level of 659 feet, and from summit level to Georgian Bay of 98·5 feet, a total of 757·5 feet. The number of reaches, however, would be only 23, as flights of two locks would be provided for at the Rocher Capitaine Rapids, and at the lower and upper Paresseux Falls.

The choice of the summit presents certain difficulties. If a summit were established which included Lake Nipissing, the question of water-supply for the largest possible traffic through the canal would be solved. But a more economical proposal is to establish a storage basin above that of Lake Nipissing, including Trout, Turtle and Talon lakes, which would collect a sufficient water-supply to pass through the lock system such an amount of traffic as would be likely to offer for passage by the proposed route.

The estimated cost of building a navigable waterway, such as has been described, from Montreal to Georgian Bay is just under 100,000,000 dollars. If, instead of the canal following the Lake St. Louis and St. Lawrence route, the Rivière des Prairies were chosen, the estimated cost would be a little less, about 94,000,000 dollars. The probable cost of annual maintenance has been estimated at 900,000 dollars.

The principal advantage of the new waterway would consist in the shortening of important routes, as shown in the table below :—

DISTANCES IN STATUTE MILES OF WATER ROUTES FROM PORTS ON THE GREAT LAKES TO LIVERPOOL.

Proposed New Canadian Route.

Via Great Lakes, Georgian Bay Ship Canal and Montreal.

	To Montreal.	Montreal to Liverpool *via* Belleisle.	Total.
Fort William to Liverpool,	934	3189	4123
Duluth,	1056	3189	4245
Milwaukee,	906	3189	4095
Chicago,	972	3189	4161

Present Canadian Route.

Via Great Lakes, Welland and River St Lawrence Canals and Montreal.

	To Montreal.	Montreal to Liverpool *via* Belleisle.	Total.
Fort William to Liverpool,	1216	3189	4405
Duluth,	1338	3189	4527
Milwaukee,	1176	3189	4365
Chicago,	1242	3189	4431

United States Route.

Via Great Lakes, Erie Canal, Hudson River, and New York.

	To New York.	New York to Liverpool.	Total.
Fort William to Liverpool, . .	1358	3571	4929
Duluth, ...	1480	3571	5051
Milwaukee, ...	1318	3571	4889
Chicago, ...	1384	3571	4955

Port Arthur or Fort William being taken as starting-point, the distance to Montreal via the proposed waterway is 934 miles; via Lake Erie and the Welland Canal, 1216 miles: via Buffalo and Erie Canal to New York, 1358 miles; giving a difference in favour of the projected route of 282 miles as compared with the existing St. Lawrence route, and of 424 miles as compared with the Buffalo-New York route.

The time of transit from Georgian Bay to Montreal would be, it is estimated, about seventy hours. The route would be from one to one-and-a-half days faster than any other existing water route, under present conditions, from the head of the Great Lakes to an ocean port, and would also have an enormous superiority as to carrying capacity. Vessels would be able to make more trips during the season, which would have a tendency to reduce the rates. But, as compared with a possible improved system of St. Lawrence Canals to a depth of 22 feet, assuming that the number of locks would be greatly reduced and some of the channels widened, the benefit in time of transit claimed would naturally be lessened, the saving in distance being offset by the longer stretches of lake and wide river navigation which exist through the Lake Erie and Lake Ontario route, where higher speeds would be permissible.

A careful analysis of the work to be performed shows that a period of ten years from inception would be necessary to open the waterway to navigation. It has been argued, therefore, that the proposal to deepen the existing St. Lawrence and Welland Canals is the sounder, in view of the intended improvement of the Erie Canal by New York State, for it would be difficult to divert from the United States route the new traffic which would have sprung up before the Georgian Bay Canal could be finished.

The Georgian Bay Ship Canal would offer, however, the advantage of opening up a new tract of country to the sea, a tract of country which has natural wealth in extensive mineral deposits and a great lumber industry. The waterway would open to the lumber trade of the Ottawa valley the important markets of the Great Lake region.

The total enrolled tonnage on the Great Lakes is now over 2,000,000 tons, but the great bulk of it deals with traffic which cannot be diverted,

80 % of the Upper Lake trade being in ore and coal between Duluth and Lake Erie. There remains, however, a grain trade between the head of the lakes and the ocean ports, which would be developed by the proposed waterway. Canadian coal from the East of the Dominion, being taken as return cargo, would be able to compete on a more equal footing with that sent from the United States ports on Lake Erie to Canada.

A further advantage of the route is the immense water-power thereby made available for the development of manufacture. The "lock and dam" system to be employed would concentrate such power, and bring it within reach of economic and industrial enterprise.

Though the proposed course of the canal is far from international boundary lines, and no international waters are involved, it being fed by streams and lakes entirely within Canadian territory, the argument that Canada would, by the construction of the canal, be rendered independent of the United States in respect of outlets for sea traffic, cannot be upheld. The difficulties which Canada has in securing satisfactory communications by sea are due to the climatic conditions in the East of the Dominion.

Low temperatures are favourable to the transport of perishable goods, *e.g.* meat, but this fact is not of such importance as the influence of the temperature on the length of the navigation season. The conditions prevailing at initial points of the transport system from the Great Lakes to the sea are shown by the following table :—

AVERAGES 1880-1905.

	Opening of navigation.	Closing of navigation.	Days open.
St. Mary's Falls Canals, Lat. 46° 30′ N. Elev. above M.S.L., 601·75 feet.	April 23	Dec. 9	230
French River Harbour, Lat. 46° N. Elev. above M.S.L., 580 feet.	April 26	Dec. 3	221
Lake Nipissing,* at North Bay, Ont., Lat. 56° 15′. Elev. above M.S.L., 640 feet.	April 27	Dec. 4	221
Ste. Anne Locks, Lower Ottawa River,	April 25	Nov. 27	216
La Chine Canal,	April 30	Dec. 1	215
Montreal Harbour,	April 24 (first arrival from sea.)	Nov. 25 (last departure for sea.)	215

These figures show that there would be a very short period after harvest when the canal would be free from ice, and every twenty-four hours is of importance in the case of a means of transit where only a limited number of vessels can pass each day.

* Approximate only.

A NOTE ON WIND-STARS.

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Allan Glen's School, Glasgow.

(*With Figures.*)

One of the simplest yet most interesting exercises in the study of the weather is the observation and recording of wind-direction. No apparatus is required unless extremely accurate results are necessary, yet quite a whole series of interesting relations can be made out between wind-direction and other weather conditions. The results are best shown in graphical form, and an almost ideal bit of practical work in schools is to observe, record, put in graphical form, and finally draw conclusions from, the wind-directions for a period. The observations are easily and accurately made, their graphical expression is simple yet striking, and the deductions to be made have the *obviousness* that is so necessary if they are to be grasped by immature minds.

The usual method of representing wind-direction graphically is by a wind-star or wind-rose ; but there are several ways of constructing wind-stars, and the object of this note is to indicate which, in the writer's opinion, is best. We shall assume we are dealing with wind-records for a month. In all cases the eight principal points of the compass are first drawn. Taking any convenient unit we mark along each direction the number of days during which the wind blew from that direction. Instead of taking the actual number of days we may take the percentages, as is done in the figures, but the results are similar. There are now several methods that can be followed. The lines obtained may be thickened, and the result left as in Fig. 1. This has two disadvantages. The lines alone do not emphasise the difference between the prevalent directions and the other directions nearly so well as the other methods. Again, directions intermediate between the eight principal points are not represented in any way by this method.

In the second method the end points of the lines shown in Fig. 1 are joined, and a star is obtained as in Fig. 2. This is the method that is perhaps most commonly used, and was the one always adopted by the writer till recently. De Courcy Ward in his *Practical Exercises in Meteorology* draws his wind-stars thus, and in this way are drawn the elaborate and valuable series of wind-stars published in the volume on Meteorology of the *Scotia* Antarctic Expedition. It expresses the results in a clear and striking way, but it has one disadvantage. It gives the impression that for points intermediate between the eight points shown there is a continuous change in the direction of the wind, whereas the change may not be continuous but may take place in leaps.

For this reason the third method of drawing the wind-star seems the best, for it implies no assumptions and represents on paper what is actually done by the observer. Here in recording the directions (to take a particular example), all the winds blowing between SSW. and WSW. are entered as south-west, and therefore in the wind-star the south-west

point of the star is made to include all directions between SSW. and WSW. Again, there was in reality no gradual passage between the number of days on which wind blew from the south-west and the number of days on which wind blew from the south, and this discontinuity is also expressed by the diagram. It was Professor Becker of Glasgow

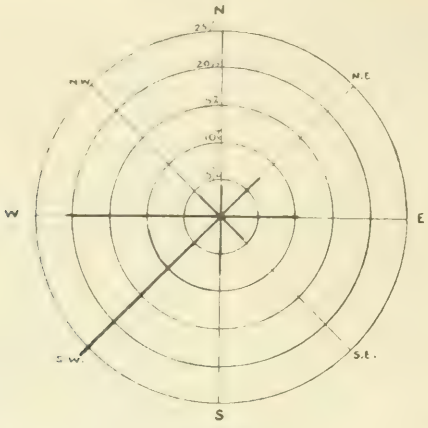

Fig. 1.

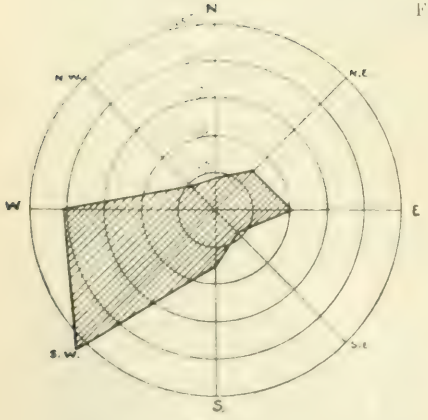

Fig. 2.

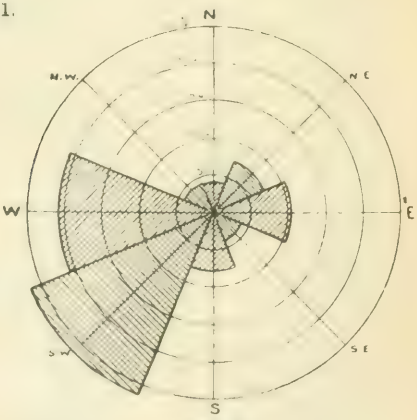

Fig. 3.

Wind Stars showing Wind frequency at Glasgow during the month of January.
Average of the 16 years 1893-1908.

University Observatory who pointed out the advantages of this method to the writer.

Other weather conditions related to wind-direction can be expressed by wind-stars, and a few of them may be briefly indicated. When the daily rainfall is kept, the total amount of rain from each of the eight principal points can be shown graphically in this way. If the total amount of rain for each direction be divided by the number of days on

which rain fell, then the amount of rain per day may be similarly shown. This gives what may be called the rainiest direction of the wind, and often very interesting results are shown by this star. Finally the mean temperature throughout the period during which the wind blew from any direction may be plotted along that direction, and the relation between wind-direction and temperature expressed diagrammatically.

Even schools which do not possess instruments can do much useful work in weather study. Several of the daily papers publish meteorological data which can be used for practical exercises; for, after all, it is not the obtaining of the data that is of prime importance, but the ability to handle facts, and from them to deduce principles.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

Lectures in January.

At Dundee, on the 20th inst., Professor John L. Myers, F.S.A., will deliver a lecture entitled "The Geographical Study of Greek and Roman Culture." Mr. M. Aurel Stein, Ph.D., will address the Society in Aberdeen, Edinburgh and Glasgow on the 26th, 27th, and 28th respectively on his "Geographical and Archæological Explorations in Central Asia." Sir Ernest H. Shackleton, C.V.O., F.R.S.G.S., will address the Aberdeen Centre on the 31st inst. The title of his address will be "Nearest the South Pole."

GEOGRAPHICAL NOTES.

Europe.

The Highlands of Scotland.—In a recent issue of the *Bulletin* of the Société de Géographie de Lille there is an interesting article by Professor Demangeon of Lille on a tour in the Highlands of Scotland. The article gives a very just and sober account of the region, and the author's comments throw incidentally some interesting side-lights on the chief differences between Scotland and France, both as regards physical geography and conditions of life. Those who write with more or less regularity to the daily papers here to complain of the unpunctuality of Highland trains and coaches, may be interested to note that in the eyes of a stranger these "function with mathematical regularity." Very instructive also is the description of the effect upon the Scottish nation of the varied physical geography of the country, and especially of the combination of mountain and plain.

The Climatology of Italy.—A recent article by M. Filippo Eredia in the *Rivista Geografica Italiana* gives a historical account of

investigations on this subject, with special reference to the last published work on Italian Climatology, that by G. Roster—a very comprehensive monograph discussing the subject from many points of view. Roster divides the country into five climatic zones, based upon the range of temperature. These zones are the following: (1) The Po valley and surrounding regions; (2) the internal peninsular region; (3) the maritime region of the Adriatic; (4) the maritime region of the Mediterranean; (5) the insular region. The conditions of temperature in these regions are shown in the following table:—

Region.	January.	July.	Year.	Annual Range.
I.	1°·43 C.	23°·19 C.	12°·33 C.	21°·76 C.
II.	4°·28	23°·19	13°·22	18°·91
III.	5°·25	24°·59	14°·64	19°·37
IV.	7°·95	24°·31	15°·68	16°·36
V.	10°·09	25°·20	17°·13	15°·11

The figures upon which this classification is based show that the temperature is much more dependent upon height above sea-level and upon distance from the sea than upon latitude. Further, it is shown that in any particular region in proceeding from the coast inwards the January temperature and the mean annual diminish, while the July temperatures increase. These facts are of course not novel, but they form a good illustration of one of the axioms of physical geography—the equalising effect of the sea upon climate.

Asia.

Lieut.-Col. Kozlow's Expedition to Central Asia.—This expedition (cf. vol. xxiii. p. 488) has now completed a year's work and has made some interesting discoveries. The expedition entered Mongolia from Kiakhta, to the south of Lake Baikal, and at an early stage made a discovery of great archæological interest near an ancient channel of the Etsin-gol, a river which rises in the Nan Shan Range and flows northwards into the Gobi Desert. Some miles to the east of the present river bed were found the sand-buried ruins of an ancient city, which had evidently been a place of considerable importance, and which is known to-day to the Torguts living along the banks of the Etsin-gol as Khara-Khoto (Black City), or Baishen-Khoto (Fortress City). Excavations among the ruins yielded a great quantity of ancient documents, coins, ornaments, household utensils, and miscellaneous articles, which were at once despatched to St. Petersburg, and which have enabled experts to determine that the city flourished between the eleventh and fourteenth centuries. Legends are still current which tell that a former Prince of Khara-Khoto aspired to seize the throne of China. A large army was despatched against him, and after a series of battles he was compelled to take refuge in his capital, to which the Chinese then

proceeded to lay siege. The garrison was brave and devoted, and the siege dragged on until the Chinese hit upon the device of diverting the course of the river by means of a huge dam, traces of which can still be seen. The Prince made desperate efforts to obtain a fresh supply of water by digging wells of great depth within the fortress, but without success. At last, when his position became hopeless, he killed his wife and children, made a breach in the walls, and sallied out at the head of his forces to die in a last great battle against the Chinese. The city was destroyed, and the sands of the desert now lie heaped over the ruins.

After further explorations in the desert the expedition proceeded to the great Lake Kokohor. The mountains are inhabited by bands of mounted nomads, armed with quick-firing rifles of German, Japanese, and Russian manufacture, and the Chinese predicted all sorts of misfortunes to the expedition if it persisted in going forward. Nothing, however, happened, and Colonel Kozlow was able to spend three weeks on the southern shores of the lake, taking scientific observations and studying the hydrography of the region. The expedition was provided with a canvas boat, in which several excursions were made on the lake. These excursions were attended by considerable danger, for the boat was but a frail craft, and the lake is really of the nature of a small inland sea. Its coast-line measures about 230 miles, and it is subject to sudden and violent storms.

The most extended excursion was a voyage to the island of Kuisu, which had never before been visited by Europeans, or, indeed, by any boat party, though in winter, when the lake is frozen over, numbers of pilgrims make their way to the island over the ice. Two of the members of the scientific staff spent four days on the island, which they found to be inhabited by three monks, each of whom lives in a separate cave and has his own flock of sheep and goats. A temple has been built on the island, and many curious images were noticed in the caves. Soundings in the lake gave a greatest depth near to Kuisu of 120 feet. Colonel Kozlow reports that the lake is slowly but surely shrinking, and, in confirmation of his observations, the native inhabitants of the region state that the island of Kuisu has grown perceptibly larger within the memory of the older men among them. Apart from the work of the main expedition, detached parties explored a considerable tract of country east and west of Colonel Kozlow's route. A previously unknown corner of the Chinese province of Kansu was visited, and the positions of nine new towns were marked on the map.

A full account of the expedition appears in the October number of the *Geographical Journal*.

The Geography and Geology of the Himalaya Mountains and Tibet.—In our issue of January 1908 (vol. xxv. p. 18) we summarised the contents of the first three parts of Colonel Burrard and Mr. Hayden's monograph on this subject. More recently, Part IV., dealing with the geology of the region, has reached us. It is written by Mr. Hayden but has an appendix by Colonel Burrard. The contents to a large extent are

outside our scope, but those points of geological structure which directly affect the geographer may be briefly summarised.

The rocks of which the Himalayas are composed fall into three series:—(1) the sub-Himalayan series, composed of sedimentary rocks mostly of Tertiary age; (2) the central series or Himalayan zone, consisting of granite and other crystalline rocks and of sediments of unknown age; (3) the Tibetan series, composed of fossiliferous sedimentary rocks, of virtually all ages from the oldest to beds of Tertiary age. The first series includes the famous Siwalik beds with their important fossils. These beds are separated from the older beds, throughout their extension, by the main boundary fault, which seems to occur throughout the whole length of the Himalayan range. The absence of fossils in the sedimentary beds of the Himalayan series renders the determination of the age of these beds a matter of great difficulty. On the other hand the richly fossiliferous beds of the Tibetan zone show that this region must have been submerged beneath the sea from Cambrian till Tertiary times. Without following Mr. Hayden in his account of the geological history of the Himalayan area, it may be noted that the range itself appears not to be older than the later part of the Eocene period.

In regard to economic geology it is noted that the region is poor in minerals of commercial value. Only three mineral substances are at present worked to any extent, these being salt, slate, and sapphire. A considerable number of other minerals occur, but not in sufficient quantities to be worked at a profit.

America.

The Atlantic Forest Region of North America.—Those who read here, in our issue of July last, Professor Penck's article on North America and Europe, may be glad to have their attention called to an article by Mr. Spencer Trotter in the October number of the *Popular Science Monthly*. The article is entitled "The Atlantic Forest Region of North America," and gives an interesting account, somewhat on the lines of Professor Penck's study, of the effect upon the population of North America—aboriginal and introduced—of the forest which originally clothed the eastern region. Among the interesting points brought out are the contrasts between the eastern and western forest belt in North America, and also the great difference between the forest regions of Europe and those of eastern North America. The author shows that in wealth of species, and in the character of the trees, the American forest region can only be compared to that of the Far East. The resemblance between the forests of China and Japan and those of the Atlantic States the author explains by reference to the Glacial Period. In pre-Tertiary times a warm-temperate forest extended over the whole circumpolar region, including Greenland and Spitsbergen. Driven southwards by the ice, many of the trees of this forest were able to survive only in the south of the far eastern region and in the eastern

States of America, whence they crept north again with the improvement of the climate.

Another interesting little point is the emphasis laid upon the number of herbaceous plants in the United States of a woodland and shade-loving type. These point backwards to the early days when the eastern part of the country was all forest-covered. When the European settlers cleared the forest it was the weeds which they brought from Europe which colonised the cleared land. Now, to find the genuinely indigenous plants of his native land, the American must leave the fields and seek them in the remnants of the original forests—must go into the woods.

Geological History of California.—Professor J. B. Smith has an article on this subject in a recent issue of *Science*, which throws interesting side-lights on the present configuration of California. Interesting also is the comparison with which the paper closes between the geological history of the eastern and western coasts of North America. In both cases, Professor Smith points out, there was a pre-glacial elevation of the land which led to the erosion of deep canyons. This in both cases was followed by a southward extension of the glaciers, again followed by a subsidence and amelioration of climate. A period of elevation and moderate erosion ensued, and there came finally the subsidence which made the fiords of New England and Puget Sound, the gentle bays of California and Oregon on the west, and the sounds of the Atlantic States on the east. On both sides of the continent, therefore, submerged canyons run out to sea, marking the course of the drowned rivers of early Quaternary times, and now forming channels of navigation which render possible the rise of important ports on both eastern and western coasts.

General.

The Systematic Description of Land Forms.—In the *Geographical Journal* for September last, Professor Davis of Harvard University has an interesting article with this title. The object of the paper is to investigate the possibility of finding a method of explanatory description of land-forms which shall treat these from the point of view of their origin. More fully, Professor Davis believes that it is possible to find terms which shall, when applied to any land-form, describe generally the structure of the form, the nature of the erosive process to which it has been subjected, and the stage to which this erosion has attained. As an example may be given Professor Davis's description of Snowdon and its neighbours as "consisting of greatly deformed and resistant strata, which have been recently submaturely glaciated, after having been normally reduced to subdued forms." This description involves the three features of *structure*, *process*, and *stage* which Professor Davis regards as the essentials of his method. In the discussion which followed the reading of the paper, criticism chiefly centred about two points, one that the method is dangerous in that geologists are frequently by no means agreed as to the origin of a particular land form, and second that after all the

geographer as geographer is more concerned with the effect of land form on human life that with its origin, which is often irrelevant from his point of view. The paper contains a very interesting illustrated account of the Italian coast between Genoa and Spezia, which is described as displaying "a combination of normal and marine erosion, with a slight movement after maturity was reached."

A Geographical Annual.—We noted two years ago (vol. xxiv. p. 157) the fact of the conversion of the *Revue de Géographie* into an annual, and summarised somewhat fully some of the papers contained in the first annual volume. The second annual volume, that for 1908, has been lying in the library for some months, but as space does not permit meantime of an extended analysis of its contents, we can only notice it generally, with a view to calling attention to the value and importance of the contained papers.

The International Map of the World.—In our account of the Ninth Geographical Congress held at Geneva in 1908 (cf. vol. xxiv. p. 523 *et seq.*), we gave a full account of the Resolution and Recommendations passed by the Congress in reference to a proposed International Map of the World on the 1 : 1,000,000 scale (that is about 16 miles to the inch). In pursuance of the aims set forth in these recommendations, a conference of delegates from the leading Governments of the world and certain British Colonies was held at the Foreign Office in London, during November last. Twenty-four delegates were present, and considerable progress is reported to have been made with the scheme. Meantime no official report is available, but according to the *Times* account the recommendations of the Geographical Congress at Geneva were taken as the agenda of the proceedings, and, subject to certain modifications in detail, these recommendations were accepted as the basis for the construction of the map. In regard to the naming of the individual sheets, the following arrangements were made :—

Each sheet will bear an international number and also the name of the most important place or feature on the sheet, so that, in whatever country it may be issued, a sheet can at once be ordered by its number and name. The numbering is to start from 180 deg. E. or W. of Greenwich, and the sheets are to be numbered from one to sixty, increasing in an easterly direction. The Zones extending from the Equator on each side to 88 deg. N. or S. latitude will be given letters from A to V. The Polar areas will be lettered Z, preceded by the word North or South. Thus each sheet can be identified by its number and letter.

Personal.—In connection with the death of Leopold II., King of the Belgians, it may be noted that the late King was the first Honorary Member of the Royal Scottish Geographical Society. He displayed great interest in the founding of the Society, visiting its rooms and presenting it with his portrait.

Of geographical interest is the fact that with the death of the King, the lease of the Lado enclave lapses, so that this region now comes under British control.

Commercial Geography.

Proposed Euphrates Railway.—In the report addressed to the Ministry of Public Works since his return from Mesopotamia, Sir William Willcocks advocates the construction of a railway from Baghdad to the Mediterranean. The proposed railway would start from Baghdad, cross the Euphrates at Feludia, and follow the valley to Hit. At Hit the line would take the Euphrates valley and traverse the flat desert in a straight line to El Kaim, near Abu Kemal, the northern limit of the cataracts. From El Kaim to Der Zor the Euphrates has no cataracts, and the river Khabur, which joins the Euphrates at Mayadin, the ancient Rehoboth, is, like the Euphrates, navigable during the whole year. These parts of the Euphrates and Khabur could be extensively developed and all their products transported to El Kaim by boat and thence by rail. From El Kaim the railway would proceed to Tidmor (Palmyra) and follow the old trade route over a flat desert supplied with water. From Palmyra the line would go either to Homs or Damascus. The total length of the railway from Baghdad to Damascus is estimated at 550 miles, and the cost of construction at £2,200,000.

The Trans-Andine Tunnel.—At the end of November last this tunnel was broken through, and it is expected that by March next it will be possible to travel by rail right through from Buenos Ayres to Valparaiso. The whole tunnel when completed will be about three miles in length, and the summit level of the railway will be 3190 metres, or about 10,460 feet above sea-level. The works at the Argentine end were begun in October 1905, and those at the Chilian end somewhat earlier. The following description, taken from the *Times*, shows under what difficulties the work has been carried on.

The top of the mountain range through which the tunnel is being driven is composed of stratified rocks tilted at a high angle. The dip varies continually, and some of the strata are almost vertical. As in all parts of the crest of the Andes, the rocks are subject to extreme weather conditions. Owing to the constant percolation of melting snow, decomposition continues to great depths below the surface, especially along the planes of stratification and in fissures. The rocks cut in the eastern half of the tunnel are chiefly limestones, with beds of gypsum, layers of sandstone, with some narrow clay bands, as if along the line of faulting, and some beds of conglomerate full of very hard rounded water-worn pebbles and small boulders. Especially near the mouth all the joints and fissures are so decomposed that the rocks were found very loose. Even under the crest of the mountain, with some 2000 feet of strata overhead, the decomposition of the fissure planes caused by percolation of water can be observed in places.

At the western end of the tunnel a change takes place, and the rocks become mainly felspathic, with beds of hard tough clay in veins. These stand much better than those of the eastern side, but there are very many joints and cleavage planes. The western side of the mountains is steeper in slope than the eastern, and the rocks are of a different

series and much more solid. Some of the rocks when thrown on the tip weather very rapidly; others stand very well where the stone is solid, but give way quickly in the joints. It is therefore necessary to line the tunnel throughout, for, while many of the rocks may in themselves stand the extremes of heat and cold, no dependence can be placed on any of the cleavage planes.

EDUCATIONAL.

A PAPER entitled "A Method for the Study of the Animal Ecology of the Shore," by Messrs. King and Russell, which appears in the *Proceedings* of the Royal Physical Society, xvii. p. 225, includes some useful suggestions which might be taken advantage of by teachers in connection with geographical excursions. The object of the authors was to study, in as comprehensive a manner as possible, the relations which exist between the animals of the shore and their environment. To do this they selected a particular area of the shore, that chosen being a small bay on the Great Cumbrae, near Millport Marine Station. They then studied the physical characters of the area, its extent, aspect, shelter, slope, the nature of the ground, the tidal currents, the salinity of the water, and so forth. This done they divided the beach up into zones, determined the amount of the area exposed to the action of fresh water, and then made systematic representative collections of the fauna, with careful notes of the conditions prevailing during each collecting excursion, the exact habitat, etc. On each occasion the date, time, weather conditions, temperature of water and of air, condition of humidity, wind, barometer, state of tide, were carefully noted, and note taken of the specimens found in every zone examined. The detailed results of the observations, which were carried out for a period of three weeks, do not concern us here, but the methods described might well be applied, with some modifications, during a series of geographical excursions. It is a familiar difficulty with all outdoor work with children that demoralisation—from the standpoint of work—is apt to supervene very quickly, unless each member of the party can be set to do something definite. Where the conditions render this possible, a great many geographical facts might be learnt by a series of excursions to a limited area, such as a small bay, following the lines of Messrs. King and Russell's method. In geographical study a map, rough or more detailed as the conditions permitted, would be naturally included in the work, and from a series of observations on air and water temperatures, the amount of shore exposed at various times, and so on, many of the elementary facts and deductions of physical geography might be learnt, while the observations would occupy many separate groups of scholars. We recommend the paper to the notice of teachers, less, as already indicated, for its technical results than for its suggestions as to method.

We have recently received the sixth (revised) edition of *A Barometer Manual for the Use of Seamen*, printed for His Majesty's Stationery Office,

and obtainable for the modest sum of threepence. In spite of its title, the manual may be recommended to the notice of those teachers of geography who include some study of the weather in their course. The pamphlet with its index runs to sixty-seven pages, and contains twenty figures as well as no less than eleven most instructive large plates, some of which are weather charts. In this new edition more attention is given than hitherto to the conditions prevailing in the southern hemisphere, and the booklet now gives a comprehensive account of the variations of pressure and the circulation of the atmosphere over the oceans. The teacher interested in meteorology will not only find here a great many facts not otherwise always easy to obtain, but the directly practical point of view may also be found useful in arousing the interest of scholars in the variations of the barometer, especially when these scholars are drawn from a seafaring community. The text-figures and charts illustrating storms in the temperate zone seem to us especially interesting, and we think that they would afford material for some excellent lessons, the matter being considered in the first instance from the practical and nautical standpoint, rather than from that of abstract science.

NEW BOOKS.

EUROPE.

Spain of the Spanish. By Mrs. Villiers-Wardell. London: Sir Isaac Pitman and Sons, Limited, 1909.

A good deal has been written about Spain of late years, many of the contributions being distinguished rather by the profusion and beauty of the illustrations than any great originality of text, and therefore it is with peculiar pleasure that we welcome a book dealing with Spain of to-day and her problems by a very competent writer. Mrs. Villiers-Wardell has evidently not only lived much in Spain, but has a wide acquaintance with its literature, both old and new. The modern fiction of Spain is not so well known as it should be, largely because it does not readily lend itself to translation, into English at any rate. The spirit is so peculiar to Spain that a great deal is lost in rendering into other tongues. But it is a noble literature, full of promise, and it were well worth any one's while to learn the language if only for the sake of its written works. The chapters on modern writers, on the drama and art generally, are most excellent.

That part of the book which deals with the future of Spain is full of suggestive interest. Following the steps of Angel Ganivet, the authoress takes the view that this future lies within the country itself. For centuries, and owing to the *perfervidum ingenium* of the Spaniard, she has exhausted herself physically and morally in her great schemes of conquest. These days have gone, and she must now seek a spiritual regeneration which will not only rejuvenate her people but draw all the Spanish-speaking countries together in the bonds of enlightenment and sympathy. We may say that these very quotations from Angel Ganivet demonstrate the difficulty of rendering his exalted aspirations into another language. The curious view is expressed that Spain must not seek to copy other nations, for the reason that she is really in advance of them. She has passed through the phase of domination which we must all pass, and is embarking even now on the higher spiritual and intellectual quest.

The chapter on the different elements which compose the kingdom, comprising peoples so unlike as the Catalonians and the Andalusians, merits careful study, and will explain the source of many of the troubles which are engaging the attention of politicians at the present time. *Spain of the Spanish* should be on the bookshelf of every lover of Spain, for it is a most useful book of reference.

Bosnia and Herzegovina. By MAUDE M. HOLBACH. London: John Lane, 1910. *Price 5s. net.*

This is a short account of a hasty scamper, chiefly by rail, over a highly interesting country. The authoress and her husband possessed a knowledge of German which was useful where the Austrian troops and officials were quartered, but the want of a knowledge of the other languages spoken in these states debarred the travellers from holding direct communication with the natives, and thereby lessens the interest of their narrative. We note that the Austrian military are employed usefully in making roads, and so are prepared by active industrial habits for earning a livelihood when they return to civil life. We note also that convict labour is largely employed in the open, fruit culture and the work of planting and cultivating orchards being done by the prisoners. This is an improvement on the conditions here, where prisoners are mostly employed at inside work of a trifling description, unfitted to be of service to themselves or to the community.

The book is illustrated by some charming photographs, and there is also a map.

The Coloured Rome: Historical, Personal and Local. By OLAVE MURIEL POTTER. With Illustrations by Yoshio Markino, an Introduction by Douglas Sladen, and an Essay by the Artist. London: Chatto and Windus, 1909. *Price 20s. net.*

One might almost call this a new departure, for it is a collaboration between a lady who knows her Rome thoroughly and a distinguished Japanese artist, the object being to describe that most elusive subject, the Colour of Rome. It is rather the fashion, especially with those who know Papal Rome, to consider that the Eternal City has been ruined by the modern jerry-builder, but the authoress takes a much saner and wider view. She recognises that if much that is picturesque has been destroyed, at any rate the result has been that Rome is now one of the most healthy and comfortable cities in Europe. The old saying that Rome was not built in a day, is paraphrased by the writer when she describes it as a palimpsest, many writings being superimposed one on the other, all of supreme interest, and the present writings, although we may not like them, are after all due to the "spirit of the age." The chapters dealing with the churches and the Vatican are perhaps the most interesting and original. It is an aspect of Rome which the visitor takes up last, and he does it imperfectly and grudgingly, but the reader of this book will visit, in the best of company, many famous spots hidden away in corners of which he has barely heard. Mr. Markino's illustrations are worthy of the book and the subject. In some of the sketches the reds predominate more than necessary, but on the whole they are very beautiful. He describes how he and his friend, when they were in bitter poverty in London, met one winter night, and by the light of a miserable dip discussed the "most pathetic history of Keats," the true spirit in which to commence the study of such a place as Rome.

Mr. Sladen's preface is really a sympathetic critique of the book.

Cathedral Cities of Spain. Written and illustrated by W. W. Collins, R.I. London: William Heinemann. New York: Dodd, Mead and Company, 1909. *Price* 16*s. net.*

All who visit Spain and care to look a little below the surface, must be struck with the great hold which religion has on the mass of the people. To us of the twentieth century the visible signs of the great struggle between Islam and Christianity are the churches. This is the standpoint which Mr. Collins takes, and although he never obtrudes this point of view on the reader, he gives the indication in the preface, and by a skilfully arranged historical sketch shows that these splendid buildings are not mere isolated specimens of this and that style of architecture, but are evidences of the recurring tides of conquest with their outbursts of religious fervour. Perhaps he has erred on the side of giving a mass of historical detail which can be found in any handbook, for, after all, the chief charm of this book consists in the author's illustrations. In some cases the colouring seems too vivid, and to lack that grave reserve which is so characteristic of Spain, but the interiors of the churches are unusually beautiful and satisfying. The sketch, for instance, of the interior of Barcelona Cathedral recalls the sombre magnificence of that church as nothing that we remember has ever done. Quite of another type, but also very clever, is the sketch of the Generalife. There are a good many rather irritating slips in the spelling of the Spanish words, probably the result of faulty revisal.

History of Scotland. Vol. III. From the Revolution of 1689 to the Disruption, 1843. By P. Hume Brown, M.A., LL.D., Historiographer-Royal for Scotland. Cambridge University Press, 1909. *Price* 4*s.* 6*d. net.*

It was said of an eminent Judge that he was a specialist in every department of the law. In the same way we may say of Dr. Hume Brown that he is a specialist in every branch of Scottish History. Whether we turn to his account of the romantic incidents of the '45, for example, or of the intricate political movements which led up to the Treaty of Union, or again to his description of the social life of Scotland at that time—which he has enriched with side-lights from continental sources—or to the theological controversies of successive periods, we find that he has stated the latest word on every subject. He has done so, moreover, in language of singular lucidity and interest, and has brought to notice many illuminating details not to be found in the standard Histories of Scotland. The area of study necessary for the production of such a history is immense, and it is a special merit of his work that he has avoided the constant temptation to digress or to load the narrative with subordinate detail. Indeed, the sense of proportion is one of the strongest features of the book, and bespeaks a real mastery of the subject. It is interesting in this connection to observe wherein his plan differs from that of earlier writers. The Darien Scheme, for instance, as an evidence of Scotland's awakening interest in foreign trade, receives somewhat full treatment, while the Glencoe Massacre is regarded as of accidental prominence. Then the social and industrial side of the national development—in which Dr. Hume Brown is perhaps most of all a specialist—furnishes some of the most instructive chapters in the volume. Throughout the story the feeling of patriotism, by no means blind, is always present, and the forcible but just summing up of his country's claims to consideration in the world of nations, which occurs at the close, could hardly have been better done. We congratulate the writer on his worthy accomplishment of the task to which he has set himself.

Things Seen in Holland. By C. E. Roche. London: Seeley and Co., 1910. *Price 2s. net.*

This is an unpretentious little guide illustrated by some charming photographs, and also by sketches. It may be recommended to the notice of those who are contemplating a tour in Holland.

Home Life in Ireland. By Robert Lynd. London: Mills and Boon, 1909. *Price 8s. net.*

In this remarkably readable volume, the author declares his belief in "the oneness" of the Irish people, for no matter from what province of Ireland Irishmen come, they belong to "one ever-evolving race." "The common talk of the 'two nations' in Ireland is an exaggeration, and leads to confused thinking about the country." It is estimated that about 75 per cent. of the population is directly dependent upon the soil. The author considers that the Irish farmer has been denationalised by three great forces—by the education given in the National schools, by landlordism, and by agrarian politics. "The schools de-Irished him and so robbed him of a sort of culture which made the air about him exhilarating and the land a land of memories and enriching thoughts." Farms are, however, being improved now that the land is coming into the farmers' own hands, and food and cookery are also improving. Still, "poverty and the want of an enlivening national spirit are the real cause of the weakness of Ireland. It is impossible for any one who has not travelled in Ireland to realise the bad conditions in which the poorest of the peasantry live. Especially so is the way in which the people have been driven out of possession of the good lands." Sixty-three per cent. (nearly two-thirds) of the whole country is given up to hay and pasture, and "nearly all the best land in Ireland is in possession of bullocks."

With regard to schools and children, Mr. Lynd says "the National schools are among the most non-sectarian imaginable," and he is inclined to think "that no class of Irish men and women serve their country more faithfully, according to their lights, than the teachers in the national schools." He holds, however, that "Irish education will never be in a satisfactory condition until the Irish people have taken it largely into their own hands," and "put an end to a state of affairs which neither the British Government nor the clergy, as a whole, show any mind to remedy."

Although "reared a Presbyterian, as they say in Ulster," the author does not consider Ireland "a priest-ridden country to anything like the degree which most people suppose." "The average intelligent Irish Catholic is as critical of priests as the average Protestant of the Protestant clergy." He says that the priests "do more persistent work in the cause of Temperance than any other body of clergymen in Ireland." "The younger Presbyterian clergy, like the younger priests, are gradually coming under the influence of a new and broader spirit. They are beginning to think of Ireland, and to see that the creation of a just and generous atmosphere in Ireland is itself a sacred work." "Sabbatarianism is dying fast in Ulster."

"The Irish gentry, as a class, are, from Ireland's point of view, one of the most worthless aristocracies in history. The ordinary Irish gentleman, who can afford to do so, lives largely out of Ireland." There are, however, many signs that the Irish gentry are taking a vital interest in their country, such as they have not taken since the days of Grattan and Lord Charlemont. One of their number recently expressed admiration of the *industrial* side of the Sinn Féin movement, which "may be described at once as the most extreme and the most moderate form

of Nationalism." It calls upon the Irish manufacturer to use Irish materials, as far as possible, in the wares he makes and buys. But it also works for the independence of Ireland, and does not wish to send representatives to the British Parliament, but to have an Irish Parliament instead. The Sinn Féin policy, however, has not yet captured the majority even of Nationalist Irishmen. The author deserves much credit for treating with breadth and impartiality a subject like Ireland which is usually so much disfigured by partisanship.

Crawford: From the Burning of the Castle by Sir William Wallace to the Visit of King Edward VII. By W. Crawford Fraser. Crawford: A. Colthart, 1909. *Price* 1s.

This is an interesting, well-written compilation from the leading authorities on this historical Scottish parish. Allan Ramsay was born in Leadhills in 1686, and attended Crawford School till 1701, when he left for Edinburgh. The author says that "*The Gentle Shepherd* is a Crawford moor pastoral."

ASIA.

A Military Consul in Turkey. By Captain A. F. Townshend. London: Seeley and Co., Ltd., 1910. *Price* 16s. *net.*

This book presents a résumé of experiences as Vice-Consul and latterly Consul in the Turkish Empire in the years 1903-4 and 1905. The bulk of the time was spent in Mersina, a fort in south-eastern Asia Minor nearly due north from the island of Cyprus; the rest being passed in Adrianople in Eastern Roumelia. The fact that the writer divided his residence in Turkey between the European and Asiatic sides of the Bosphorus, and that he had charge of the country around each of the centres from which he was instructed to exercise his calling as Britain's representative, gave him unusual facilities for seeing and estimating Turkish rule and Turkish life.

The author has summed up under various heads the different sections of his personal experiences, and the national life of the country as he saw it in the towns and in the remoter villages of the mountainous districts.

In common with others who have narrated their experiences of the internal condition of Turkey, it appears that the author found that the Turk "per se" (apart from the official Turk at Stambul, corrupted by bureaucracy and tyranny) of a most hospitable and kindly disposition, tolerant and long-suffering in the matter of foreign interference, but, once aroused in defence of his religion, one of the most tenacious, fearless, brave and obstinate of foes. Next to the Turks the author bestows unqualified praise on the kindness and good influence of the members of the American Christian Missions, wherever located, and the self-denying lives they lead in some of the rude, fanatical, back-lying districts of Asia Minor, where they are isolated for months on end by the inclemency of the weather from all civilised society. For the Jews the author has nothing good to say. In the recent massacres of Armenians they piloted the infuriated savage Moslems to the houses where the Armenians dwelt. Numbers of the Jews become every year converts to Islam, the principal stumbling-block to this so-called conversion being the necessary avowal that Jesus Christ was a great prophet. Great difficulty arises in the administrative government of the country from the many religions and races comprised in the Empire's population. There are among others two rival sets of Mohammedans, and followers of the Greek Church, as well as Jews and Armenians and races so widely apart as Bulgarians and natives of our Indian Empire. Kurds and Circassians are the troublesome "ne'er-do-weels" in Asiatic Turkey, being given to brigandage and robbery under arms against the industrious and well-disposed

inhabitants living beyond the immediate protection of armed force. Curiously enough the author does not seem to have come into contact with the mountain-roving Albanians, those bloodthirsty renegade Christian Moslems, the fierce upholders of the "Shadow of God on earth," whose ferocity is only equalled by the cannibal head-hunters of Borneo and New Guinea.

The narrative is written in a fair and dispassionate manner, interspersed with interesting anecdotes descriptive of the ways of the country. The author's journeys into the interior behind Mersina, his ascent of mountain-passes, including one 6800 feet high, were both daring and arduous, undertaken as many of those excursions were in snowy, stormy weather, with very imperfect guides, and as a rule miserable hostelry accommodation for man and beast. He found saddle-horse and pack-horse to be the best way of negotiating the hilly uplands, their steep ascents and dangerous declivities. With an interpreter, a zaptieh, and a mixed assortment of Moslem and Christian servants, and armed with the Government touchstone, a "buyuruldu," the traveller overcame all difficulties.

The book is printed on light paper in clear bold type, and is illustrated throughout with a series of photographic pictures.

A Scamper through the Far East. By Major Herbert H. Austin, C.M.G., D.S.O., R.E. London: Edward Arnold, 1909. *Price* 15*s. net.*

In the course of Major Austin's *Scamper* he covered a distance of 20,000 miles by rail, road, and water during sixteen weeks' travel, and in this time he managed to visit the scenes of the principal battles in Manchuria fought during the Russo-Japanese War; to traverse Korea; to be present at the Japanese military manœuvres at Nara, and to make sundry tours on foot in Japan, a part of these being through country which is seldom visited by Europeans. Throughout the whole journey, besides using much diligence and energy in covering the ground, Major Austin has brought to bear powers of observation beyond the ordinary, and the fruits of his pilgrimage are exhibited in the volume before us.

The journey from London to Moscow, and thence through Siberia by the Trans-Siberian Railway to Harbin, Mukden, and Port Arthur, is described in a fashion which is calculated to tempt readers who follow the author on his travels to perform a like pilgrimage for themselves.

The chapter on the journey from Harbin to Mukden and Port Arthur throws a light on the political and military situation in Manchuria. By the terms of the treaty of Portsmouth it is well known that Russia and Japan are each permitted to retain fifteen men per kilometre as "guards" for their respective railways, although the nominal evacuation of the country was completed by April 15th, 1907. This means that Russia maintains a force of over 27,000 troops in Manchuria, while Japan has about 15,000. As the author remarks, the situation thus brought about is one of great complexity, and it is no secret that Japanese and Chinese interests frequently come into collision. He points out that the future of Manchuria is undoubtedly one of the big questions looming in the Far East, and he remarks with truth on the faculty which China has shown in her past history for absorbing her conquerors. In the meantime the Chinese are doing their best to attract large numbers of settlers to Manchuria from amongst their own surplus millions, while Japan is striving in a similar way to settle colonies of her own people on the land.

In describing his visit to the palace of the Manchu emperors at Mukden, and the wonderful treasures which he saw there, the soldier author is "profoundly impressed by the fact that plenty still remains which is worth looting"!

Major Austin takes a rapid survey of the defences of Port Arthur and the

historic scenes of the battles in Manchuria, and also gives an outline of the course of events from the outbreak of the recent war down to the signing of the treaty of peace on 5th April 1905.

An interesting light is thrown on the present condition of the reformed army of China in an account of an inspection of the Chinese garrison at Mukden by General Broadwood, the G.O.C. at Hongkong. Major Austin says, "The physique of the men was very fine, for they were all tall, strapping young men, who were well set up, and held themselves with true military bearing." It is worth noting that the guns of the artillery were made in the Chinese arsenal at Hanyang. Summing up his impressions of the Chinese troops, Major Austin says, "It was, I frankly admit, a great revelation to me, for I had not imagined they had as yet approached anything of the high standard of efficiency and smartness which, from all outward appearances, one can only judge they have." . . . "When one considers the strides China has made during the last few years in the matter of education, by which movement she has upset the traditions of a thousand years, while she has also realised that a nation without an army is an easy prey for more adventurous spirits, it is natural to assume that she has at length been convinced of the necessity for marching with the times, and that the regeneration of China bids fair to be an accomplished fact before the world becomes much older." . . . "We saw various educational institutions, such as kindergarten, military school, and the agricultural college, at all of which sound, practical instruction appears to be given; and as admission to the more advanced establishments can only be obtained by competitive examination, it may be inferred that in the near future the best men that China claims are bound to come to the front in all the various branches of science, and professions. And, when that day dawns, who can doubt but that a new and mighty power will have arisen whose voice may not be disregarded in the council of states? But it is not yet." These are weighty words, and may well give pause to all who regard the future of Britain in the Far East.

In view of the recent assassination of Prince Ito, what Major Austin says of Japanese influence in Korea is worth attention.

Considerations of space do not permit of our referring in detail to the author's account of the Japanese military manœuvres, nor to his remarks on the country and people of Japan, but we may say that the whole book is one of absorbing interest, and that it throws much light on a part of the world which may be the theatre of important events in the near future.

Through Persia. By F. B. Bradley-Birt, I.C.S., F.R.G.S. London: Smith, Elder and Co., 1909. *Price* 12*s.* 6*d. net.*

The words of Mr. F. B. Bradley-Birt ought by this time to be well known to all our readers. In this, his last one, he describes a journey home from India *via* Persia, where, landing at Bushire, he marched over the passes to Shiraz and thence to Ispahan and Teheran, from where he made his way to the Caspian. Persia, if we are to believe Mr. Bradley-Birt, must be anything but a comfortable country to travel in, even for one who is well accustomed to roughing it in camp in India. Mosquitoes, sandflies, bugs, fleas, etc., abound, and defy even an experienced traveller. The conveyances available for transport are primitive and rickety, the horses are wretched screws; the mules, albeit sure-footed, are slow and tedious; the accommodation at the caravansarais is meagre, dirty, and uncomfortable. All this, however, did not prevent the author from having a very enjoyable time in his journey through the country, which he describes with a graphic power of language and a wealth of ornate word-painting, which those

who have read his former works will readily recognise. Take for example this description of the view of the city of Shiraz from the Ispahan road. "When this first view of the city strikes upon the eye of the traveller from Ispahan, or lies spread to bid the departing guest farewell, there is small wonder that it calls forth from the enthusiastic wayfarer the exclamation of astonishment and admiration, 'Allahu Akbar.' 'God is great.' It is impossible to describe its charm, the extraordinary sense of the unreality of its beauty. It is almost theatrically beautiful, like some drop-scene of a theatre, perfected into a thing of life. Away down in the midst of the vast plain lies the city, half-hidden among the trees, only its domes of flashing blue mosaics and its glittering golden minarets ablaze in the sunlight. The river, a narrow, winding stream in its broad bed of yellow sand, runs like a crystal chain beside the city. The grave garden of Sadi lies an oasis of green at the foot of the hills. Beyond, and on every side, the hills rise up encircling the plain, their bare serrated slopes clothed in every shade of purple and brown in the morning light, and away to the right crested with new-fallen snow, the last fall of the waning winter that the sun of spring will soon dispel. And all the perfect scene lies set in the brilliant blue of an eastern sky, and the shining clearness of a morning of spring in Shiraz." From his route Mr. Bradley-Birt visited Shahpur, Persepolis, the tomb of Cyrus, and other places of interest, all of which afford him the opportunity of presenting to the reader graphic and eloquent sketches of their past history and present appearance and condition. In the concluding part of his book, the author touches lightly on the present unrest and political disturbances in Teheran and Persia generally, of which apparently he does not think much, as they irresistibly remind him of comic opera. His sojourn in Persia, however, was far too short to permit of his forming at first hand and from personal observation and consideration of facts a mature opinion of serious value. The unrest in Persia is unquestionably one symptom and phase of the unrest, which is now so general all over the East. The book is well illustrated with many beautiful photographs, and we cordially recommend it to the perusal of all of our readers who are interested in the Land of the Lion and the Sun.

Three Years in Tibet. By the Shramana Ekai Kawaguchi. Published by the Theosophist Office, Adgar, Madras; Theosophical Publishing Society, Benares and London. 1909. *Price* 16*s. net.*

From the preface of this curious and remarkable work we learn that we owe its publication to Mrs. Annie Besant, the well-known high-priestess of Theosophy. It appears that the Rector of the Gokyakurahan Monastery in Tokyo was exceedingly anxious to translate "into Japanese in an easy style from the difficult and unintelligible Chinese," the holy texts of Buddha. For this purpose, in 1891, he resigned the Rectorship of the monastery and proceeded to Kyoto, where he worked assiduously for three years. He came, however, to the conclusion, that for his purpose it would be wise to compare the Chinese texts with the Tibetan translations and the Sanskrit texts, which were to be found in Tibet and Nepal: and with this intention he travelled from Japan to Darjeeling and thence to Nepal and Lhasa, in which forbidden city he stayed for a year and then made his escape into British territory. He claims to be the first Japanese explorer of Tibet, and published an account of his travels and adventures in a Tokyo newspaper. These articles were collected and translated into English, but the publication was delayed, as the author believed that his story had been discounted by the abundant information about Tibet acquired by Sir Francis

Younghusband's expedition. Mrs. Besant, however, heard of the work, was allowed to peruse it, and urged its publication as it "would prove interesting to the reader from the point of view of an Asiatic, intimately acquainted with the manners, the customs, and the inner life of the people. She also pointed out to me that the book would prove attractive to the general reader for its stirring incidents and adventures, and the dangers I had to pass through during my travels." We cordially endorse Mrs. Besant's opinion. In this book the author reveals his own personal character in the most naïve fashion. It is clear that he is first and foremost a sincere and enthusiastic Buddhist, whose faith in the power and favour of Buddha never swerved, but constantly sustained him in times of extreme danger and acute distress, of which he experienced not a few. Gentle and self-controlled, however, as he was, he combined much of the wisdom of the serpent with the simplicity of the dove, and although an eloquent advocate of strict veracity, he did not hesitate from time to time to outwit his enemies or effect his purpose by prevarication and deception. His long journey of more than 2000 miles—most of it on foot—over lofty mountains and through icy rivers, was a severe strain on his physical powers, to which must be added the mental strain of continually concealing the fact that he was a Japanese posing as a Chinese Lama. His journey was diversified with all sorts of strange incidents and adventures, ranging from perils of being starved to death or swept away by icy torrents, or stript by brigands to the more dangerous, because insidious allurements of a comely damsel, heiress of many yaks and sheep, who flouted as of no consequence his monastic vow of celibacy, and "was never tired of telling me that her family was prosperous, that even Lamas were allowed to marry in her country; that it was really an excellent thing for every Lama to live happily with a wife in this world; that it would be wise for me to do so, and so on." He had acquired a smattering of medical skill which stood him in good stead on many occasions, and procured for him the reputation of being able to work miracles. With characteristic wisdom and kindness he placed it at the disposal of poor Lamas, and the fame of this, preceding him to Lhasa, secured for him on his arrival there an introduction to the Dalai Lama, with whom he had many interviews. The chapters in which Mr. Kawaguchi describes the Dalai Lama and his entourage are among the most interesting in the book. He apparently expected to find in the living incarnation of Buddha a saint and a teacher, but instead of this he found a man far more occupied with politics than with religion, and living an anxious life because of an ever-present and only too well-founded fear of death by poison. We have a number of very interesting chapters descriptive of the manners and customs of the people, more especially of the priests, Lamas, and soldiers, the hierarchy, trade, education, festivals, etc., and on the policy of Austria, China, Britain, and Nepal, each and all of whom are deeply interested in the affairs of Tibet. The author is also a poet, and composing an *Uta* or sonnet was a favourite method of giving vent to his feelings. The book is profusely illustrated with quaint Japanese sketches, and there is a rough but useful map to indicate the writer's itinerary. We cordially recommend the book to the perusal of our readers.

Burma through the Centuries. By JOHN STUART. London: Kegan Paul, Trench, Trübner and Co., 1909. *Price* 2*s.* 6*d. net.*

This rather ambitious title is here given to a short history of Burma. From long residence (forty years) no one could have been better qualified for the task

than Mr. Stuart, the managing proprietor of the *Rangoon Gazette*. The East has reason to be proud of its newspaper editors. The island of Ceylon, which was closely connected with Burma in the olden times, has had a most prolific writer in Mr. John Ferguson, C.M.G., the oldest editor in the East, who has written several books on Ceylon. Sir Arthur Phayre's book on Burma also is an excellent one, but Mr. Stuart's is in a handy form, and will be exceedingly useful to residents in Burma, and to travellers, who are now numerous in winter.

The book gives an interesting account of the tribe of Karens, which speaks well for the teaching of Christianity to them by the American missionaries. As Mr. Stuart writes, "They (the missionaries) found them hunted savages who would eat you a Burman. They have made them a nation of men, civilised, clean-living, and brave." In 1886, after Thibaw's and Queen Supayalat's deposition and deportation, when the country was seething with dacoity, the Karens came forward and did excellent work in hunting down the dacoits, and restoring order throughout the country. Mr. Stuart has shown that the glamour cast by that charming writer Fielding Hall over Thibaw and his queen has been dispelled by the light of subsequent events.

Burma may yet become a great country, and though Mr. Stuart gives no indication of a change, the day may not be far off when it will be advisable to establish a separate government there, as in the case of Ceylon. If once the railway through Yun-an was built, and it cannot be long delayed, as it has been found quite feasible, an immense impetus will be given to trade and commerce.

An Overland Trek from India by Side-Saddle, Camel, and Rail. By Edith Fraser Benn. London: Longmans, Green and Co., 1909. *Price* 15*s. net.*

This is an account of a lady's journey from Quetta through Baluchistan and Northern Persia to the oil region of the Caspian and Tiflis to Constantinople, and then by the Oriental Railway Express to England. The book also includes an account of a stay of a couple of years in Seistan, where Major Benn was appointed first British Consul. The narrative concludes six years ago, and is therefore late in publication.

There is nothing new or exciting in the story. It reads more like a log, and is full of small details and ordinary commonplace experiences. At page 313 the authoress makes an unfortunate blunder where she writes of "Prince" Ferdinand and his Princess "Queen" Draga, substituting Prince Ferdinand of Bulgaria for King Alexander of Servia! For Anglo-Indians and the lady's friends the book will possess an interest beyond that of the general reader, to whom much of the march from civilisation to civilisation reads like the thirty-third chapter of the Book of Numbers.

AFRICA.

South Africa, from the Great Trek to the Union. By Frank R. Cana, F.R.G.S. London: Chapman and Hall, Limited, 1909. *Price* 10*s.* 6*d. net.*

"The past of South Africa has been the sport of circumstances, because no human authority has existed with both the opportunity and the responsibility of moulding these circumstances to a national purpose. The future of South Africa will be what South African destiny." These are the wise and suggestive words of one of the greatest of our living pro-consuls, based on wide political and administrative experience, and after a profound and exhaustive study of the political history and conditions of South Africa on the spot. Many of our readers must be

interested in the past and present of what used to be called the Dark Continent, and to them we recommend the perusal of this volume as an useful and trustworthy guide through the tangled and involved story of South Africa during the last seventy years—*i.e.* the most strenuous and interesting part of its history. Mr. Cana has undertaken this ambitious task, and by severe and almost ruthless condensation he has completed it in a compass of some three hundred pages, of which only eighteen are allotted to the last Boer war. If we understand rightly his point of view, it is that unification, rather than federation, was all along the real goal for which both the white races in South Africa were striving, but this was thwarted and delayed by misunderstandings, maladroitness, distrust, over-haste, and other causes, which cost Africa and Britain a vast amount of treasure and lives. Obviously a detailed review of matters essentially political would be unsuitable to the pages of this magazine, especially as now we are much too near the latest phase of the events described, to be able to view them with the calm impartiality that can only be expected after a considerable lapse of time. But we cordially recommend Mr. Cana's work as an useful and very successful endeavour to set forth in brief compass and in an impartial spirit the salient facts of an interesting and eventful period, and to do justice to the many distinguished actors who took part in the stirring drama played in South Africa between 1836 and 1908.

GENERAL.

Camps and Cruises of an Ornithologist. By Frank M. Chapman, Curator of Ornithology, American Museum of Natural History, Fellow of the American Ornithologists' Union. With 250 photographs from nature. London: Hodder and Stoughton. *Price* 12*s*.

Many remote and little-known localities, widespread over the North American continent and adjacent islands, were visited by Mr. Chapman whilst in search of material for "Habitat Groups"—groups in which birds, their nests and eggs, are shown amidst their natural surroundings—for the American Museum of Natural History.

For this purpose the nesting sites, domestic habits, and flight of a number of interesting species were studied at close quarters by means of a "blind" or artfully devised screen to contain the observer and his camera; and a series of remarkable photographs, of great scientific as well as artistic value, obtained. Two hundred and fifty of these are reproduced in the present volume.

Some of the most striking of these illustrations show the curious manner in which the young of the pelican and flamingo are fed by the parent birds; others depict the strange forms assumed by these species when in flight in large flocks overhead.

Among the localities visited by the author were the bayous and keys of Florida—the nesting sites of the Brown Pelican, Roseate Spoonbill, Herons of different species, Water Turkey, and the Snowy and American Egrets. He draws a melancholy picture of the destruction of the Snowy Egrets by the "plumers," and observes, in reference to the stringent but belated laws prohibiting the killing of egrets recently passed by the State, "So, too, she has passed laws against pickpockets, but just so long as there are pockets worth picking there will be some one to pick them, and just as long as egrets' plumes are worth their weight in gold there will be some one to supply them until, a passing fancy gratified, the last plume has found its way from the bonnet to the ash-barrel."

An interesting series of pictures show the home life of that beautiful bird, the

American Flamingo, on the lagoons and marshy "swashes" of the Bahamas, where they feed exclusively on a small spiral shell of the genus *Cerithium*. Other studies were made of bird life in the cactus deserts of Arizona; of the sea-birds in the Carolinas, and of Cobb's Island off the Atlantic coast of Virginia; of the wild geese and white pelicans of Western Canada; and of the ptarmigan of the Canadian Rockies.

An interesting chapter at the end of the volume gives the author's impressions of English bird life. He points out that, while the names of many of the birds enshrined in the works of the English poets are perhaps better known to most Americans than their own commonest species, a comparison of the birds of the two countries can only be made by one who has seen and heard both.

Mr Chapman appears to have been somewhat disappointed with the songs of the nightingale and skylark, and found the blackbird the most satisfying of our song-birds, its mellow fluting recalling the "spiritual quality" of the song of the American thrushes. Everywhere he was impressed with the greater abundance of individuals, though lesser number of species, as compared with the Eastern States of America, and suggests as an explanation the less migratory habits, as a whole, of the British birds, and their better adjustment, in the older country, to their surroundings.

L'Homme et la Terre. Par Elisée Reclus. Tomes Cinquième et Sixième. Paris: Librairie Universelle, 1905-1908. *Prix* 20 *fr. chaque volume.*

With the publication of these two volumes of *L'Homme et la Terre* Reclus' great synthetic survey of man's progress is brought up to the present day: nor are prophetic glimpses of the future omitted. The work is the author's own, and was fully completed a year before his death. On his nephew, Paul Reclus, devolved the task of seeing the pages through the press and making what little revision was required.

The story of man's development is brought up to the year 1900 by the middle of volume v. The remaining one and a half volumes deal with *Histoire contemporaine* and treat of the movements and tendencies of the present day. They are chapters in sociology rather than geography, though in this borderland the distinction is not sharply demarcated.

In Reclus' hands history in its broader outlook becomes a science, in that the major movements and events are results due to certain recognisable causes which he indicates. Thus he saves the subject from the too purely emotional point of view which historians commonly assume in attributing all directive influence to a postulated human initiative. Environment of course is not the whole of history, but there can be little doubt that great movements in the world's story arise through a combination of circumstances, a combination in which both geographical and sociological controls play their part; that is to say they are the outcome of the environment physical and human. And it is in this way that Reclus has treated history, dealing seldom with single events but always with great movements. He sees in man's story a gradual upward evolution, perhaps at any one point and time backwards or forwards, but still with an ever onward tendency, so that temporary retrogression is but a single note in the whole concert of progress.

The several chapters dealing with the contemporary history and the trend of present-day movements are particularly stimulating and suggestive, and this both to student of history or geography and to politician, to the onlooker in his study and the man of action. And it is refreshing to find opinions expressed which are anything but commonplace and yet are undeniably backed by a weight of argument.

We cannot touch here on political ground, but it would certainly be worth the while of any student of Empire to read what Reclus has to say of the advantages and disadvantages of British rule in India. He is a partisan of no nation and does Britain ample justice for her colonial work, but he is not blind to the shortcomings of British policies in certain directions. It gives one food for thought to read his statement that it is an illusion to think, as the British do, that English is the language of the world, but that British audacity is increased by the thought. Significant too is Reclus' forecast that in the future we shall hear of a new movement in Africa, "ethiopianism." He is not alone in that forecast: we believe it was Sir Harry Johnston who some years ago made the same prediction.

Numerous sketch-maps are introduced in the volumes and a number of carefully selected illustrations. We notice in a map showing the *écoles supérieures* of Britain that neither Manchester nor Bristol are marked. And we may wonder why Reclus deprived the universities of London, Liverpool, Birmingham, Leeds, Durham and Sheffield of their true titles and dubbed them *écoles supérieures*.

The Recognition of Minerals. By C. G. Moor. London: *The Mining Journal*, 1909. *Price 7s. 6d. net.*

This volume, which is published by the *Mining Journal*, is intended "to assist the reader to distinguish minerals of commercial value from ordinary rocks and stones." The work opens with a few pages on prospecting and sampling; this portion of the subject might well receive more extended treatment in future editions. This is followed by a monograph on petrography, by Mr. D. A. MacAlister. Considering the avowedly practical character of the book, the composition of the igneous rocks is treated in unnecessary detail; it is difficult to see what practical purpose is served by the description of laurvikite, essexite, or napoleonite. In the following section Mr. MacAlister deals with a subject upon which he is a recognised authority, and the chapter on "Mineral Deposits" is one of the most useful in the book. The ensuing description of the various mineral species follows a classification which is based upon colour and lustre; this is undoubtedly the simplest way of treating the subject, and the descriptions are generally accurate and sufficient. The section immediately following treats of "the metallic and non-metallic elements, their compounds, and the uses to which they are put, their market value, fluctuations in price, the amount raised and used annually, the condition or degree of purity to which they should be dressed for sale." This is perhaps the most valuable section of the book; it affords a store of information of a kind which is often very difficult to obtain. Short notes on assaying are appended to the monographs upon the metals, but the author wisely points out in his preface that "assays on which the investment of capital depends ought only to be carried out by those who have been properly trained for such work." The concluding chapter on "Mining, Milling, and Dressing" affords a useful summary of common processes.

This is a helpful and reliable volume for practical workers among minerals.

The Autobiography of Sir Henry Morton Stanley, G.C.B. Edited by his wife, Dorothy Stanley. London: Sampson Low, Marston and Co., 1909. *Price 21s. net.*

The autobiography of a man who began life as a pauper inmate of St. Asaph's workhouse, named John Rowlands, and ended it as Sir Henry M. Stanley, G.C.B., M.P., D.C.L., the ever-famous discoverer of Livingstone and the Napoleon of

African travel, is no ordinary book. It tells a tale (not unknown in the history of great men) of an individual raising himself from the very humblest position to the height of fame by dint of energy, ability, and indomitable determination. Stanley's life from youth upwards was full of hardship and unremitting toil. Educated at the workhouse by a savage teacher, who eventually died in a madhouse, the inhuman treatment he received led at last to the high-spirited boy thrashing his master and running away. Shipping as a cabin-boy in an American ship with a brutal crew he reached New Orleans, and there casually met a gentleman named Stanley who took him into his employment as a clerk. Mr. and Mrs. Stanley proved good angels to the poor boy who, like millions of Americans, educated himself at slight cost by reading cheap copies of the leading English authors. On Mrs. Stanley's death he went a voyage, but on returning to New Orleans found that Mr. Stanley had had him always in his thoughts and had resolved to adopt him. He remarks, "The Mr. Stanleys of this world are not numerous." This Mr. Stanley showed him the greatest kindness and he assumed his name. On his new father's departure for Cuba, Stanley went, in 1860, to learn the business of a retail store on the Arkansas, and was soon ill of the fever which affected both white and black men in the district where he settled.

Next year Stanley's adopted father died, and the Secession War began. The women of the South were even more inflamed with passion than the men, and one of them sent Stanley a parcel of female clothing as a satire on his inaction. Instantly he enlisted in the "Dixie Greys," a Confederate regiment, and was present at the battle of Shiloh in April 1862. After fierce fighting had taken place for two days, during which over three thousand of the combatants were killed, he was suddenly made a prisoner and carried off by steamer to St. Louis. The quarters in which the prisoners were kept were horribly filthy and insanitary, and Stanley enrolled himself in the United States Artillery in order to escape them, only, however, to fall dangerously ill at Harper's Ferry, and to be discharged from the service penniless and a wreck. Again he met with a good Samaritan, in the person of a farmer's deputy, who fed and clothed him. At this point Stanley's special autobiography ends—the remainder of the book being formed from his very brief diary, a fuller journal, and comments in his note-books. The autobiography is often written with a volcanic power evoked by the fierce life-struggle which it describes. It presents a series of lurid pen-pictures, which are all the more terrible in that they are pictures from real life. It is in this autobiography, as much as in any book of his travels, that we realise the strength, sensitiveness, and Titanic force of Stanley.

Lady Stanley has edited this very remarkable volume with great care, and enriched it with several interesting portraits and a map of Stanley's three African journeys. The travels of her husband will be found described in his well-known works, but we may add, in order to complete his "strange, eventful history," as unfolded in his autobiography, that, after his unhappy experience as a soldier, Stanley took service on a farm and on an oyster-schooner, and then returned to his mother at Denbigh, where he was curtly informed that he was a disgrace in the eyes of her neighbours, and she desired him to leave as speedily as possible. Deeply chagrined, he returned to America and enlisted in the United States Navy, where he not merely saw the two bombardments of Fort Fisher but described them, in writing to the press, so graphically that he became a newspaper correspondent. This was the making of Stanley, for he thus entered the path which led to fame. First he became a war correspondent in Asia Minor, then he accompanied the Peace Commission to American Indian tribes; later he went with the British Abyssinian expedition to Magdala, and visited Athens, Asia Minor,

and Spain, all as correspondent of the *New York Herald*. Finally, that enterprising journal resolved to ascertain Dr. Livingstone's whereabouts in its own way. It sent for Stanley and asked him to go to Africa and find the missing explorer. The rest is History.

Rambles and Adventures in Australasia, Canada, India, etc. By St. Michael Podmore, F.Z.S., F.R.G.S. London : L. Upcott Gill.

This volume contains a number of sketches, describing rambles and adventures in various parts of the Empire, mostly, however, in Australia. They are written "to provide an interesting and reliable guide to emigration, travel, and sport," as the author at the end of twenty years' experience abroad has arrived at the startling conclusions that "all Government literature is misleading in every part of our Empire," and "the only reliable advice can proceed from those who have no personal motive in giving it." The sketches are readable, and may serve to while away a lazy hour.

BOOKS RECEIVED.

We have received the following books and reports :—

The Old and New Peru : A Story of the Ancient Inheritance and the Modern Growth and Enterprise of a Great Nation. By Marie Robinson Wright. 4to. Pp. 456. Philadelphia : George Barrie and Sons, 1909.

Dawn in Toda Land : A Narrative of Missionary Effort on the Nilgiri Hills, South India. By C. F. Ling, with a Foreword by Amy Wilson-Carmichael. Cr. 8vo. Pp. viii + 90. Morgan and Scott, Ltd., 1910. *Price* 1*s.* 6*d. net.*

Twelve Charts of the Tidal Streams on the West Coast of Scotland. By F. Howard Collins. Fcap. folio. London : J. D. Potter, 1894. *Price* 5*s. net.*

[Presented by P. M. Macintyre, Esq., LL.B., Advocate.

China : Its Marvel and Mystery. By T. Hodgson Liddell, R.B.A. With 40 Illustrations in Colour by the Author. Cr. 4to. Pp. xiii. + 202. London : George Allen and Sons, 1909. *Price* 21*s. net.*

Les Civilisations de l'Afrique du Nord : Berberes, Arabes, Turcs. By Victor Piquet. Avec 4 Cartes hors Texte. Pp. ix + 392. Cr. 8vo. Librairie Armand Colin, 1909. *Prix* 4 *fr.*

Wanderings among South Sea Savages and in Borneo and the Philippines. By H. Wilfrid Walker, F.R.G.S. Demy 8vo. Pp. xvi + 254. London : Witherby and Co., 1909. *Price* 7*s.* 6*d. net.*

The Thousand and One Churches. By Sir W. M. Ramsay and Miss Gertrude L. Bell. Demy 8vo. Pp. xii + 580. London : Hodder and Stoughton, 1909. *Price* 20*s. net.*

A History of Sarawak under its Two White Rajahs, 1839-1908. By S. Baring-Gould, M.A., and C. A. Bampfylde, F.R.G.S. Demy 8vo. Pp. xxiv + 464. London : H. Sotheran and Co., 1909.

In the Grip of the Nyika : Further Adventures in British East Africa. By Lieut.-Colonel J. H. Paterson, D.S.O. With Illustrations. Demy 8vo. Pp. xiv + 339. London : Macmillan and Co., Ltd., 1909. *Price* 7*s.* 6*d. net.*

Letters from China with particular Reference to the Empress-Dowager and the Women of China. By Sarah Pike Conger (Mrs. E. H. Conger). With eighty

Illustrations from Photographs, and a Map. Demy 8vo. Pp. xv + 392. London: Hodder and Stoughton, 1909. *Price* 12*s.*

Tafeln: Landschaften aus Ostasien. Von Ina von Grumbkow. Mit 2 farbigen Tafeln. 55 Textabbildungen und eine Karte. Royal 8vo. Pp. xxiii + 202. Berlin: Deitrich Reimer (Ernst Vohsen), 1909. *Price* 6 *marks.*

A Grammar of the Gbari Language with Gbari-English and English-Gbari Dictionaries. By Major Francis Edgar, B.L., F.R.G.S. Demy 8vo. Pp. 373. Privately printed and published, 1909. *Price* 15*s. net.*

Trans-Himalaya: Discoveries and Adventures in Tibet. By Sven Hedin. With 388 Illustrations from Photographs, Water-Colour Sketches, and Drawings by the Author and ten Maps in two Volumes. Demy 8vo. Pp. Vol. I. xxiii + 436, Vol. II. xvii + 441. London: Macmillan and Co., Ltd., 1909. *Price* 30*s. net.*

National Antarctic Expedition, 1901-1904. (Magnetic Observations.) Prepared under the Superintendence of the Royal Society. 4to. Pp. vii + 247. London: Royal Society, 1909.

Lotus Buds. By Amy Wilson-Carmichael. With 50 Photogravure Illustrations from Photos specially taken for this work. 4to. Pp. xii + 341. London: Morgan and Scott, Ltd., 1910. *Price* 14*s.* 6*d. net.*

Auf Neuen Wegen Durch Sumatra. Forschungsreisen in Ost- und Zentral-Sumatra (1907). Von Max Moszkowski. Demy 8vo. Pp. xvii + 328. Berlin: Dietrich Reimer (Ernst Vohsen), 1909. *Price* 14 *marks.*

Highways and Byways in Middlesex. By Walter Jerrold. With Illustrations by Hugh Thomson. Cr. 8vo. Pp. xviii + 400. London: Macmillan and Co., Ltd., 1909. *Price* 6*s.*

Promenade autour du Monde, avec S. A. I. le Grand-duc Boris de Russie. Par Ivan de Schaeck. Demy 8vo. Pp. v + 361. Paris: Plon-Nourrit et Cie, 1910. *Price* 10 *francs.*

La Ville au Bois Dormant: de Saïgon à Angkor en Automobile. By Duc de Montpensier. Avec 89 Illustrations dans le texte et hors texte d'après des Photographies de l'Auteur et deux Cartes. Royal 8vo. Pp. 252. Paris: Plon-Nourrit et Cie, 1910. *Price* 15 *francs.*

Mexico the Wonderland of the South. By W. E. Carson. Illustrated. Crown 8vo. Pp. xi + 439. New York: The Macmillan Company, 1909. *Price* 10*s. net.*

Sicilian Studies: Being a Quest for Persephone by Jane and Peripatetica. Done into the Vernacular by Elizabeth Bisland and Anne Hoyt. Crown 8vo. Pp. 282. London: John Lane, 1909. *Price* 5*s. net.*

Who's Who. 1910. Crown 8vo. Pp. xxiv + 2162. London: A. and C. Black, 1909. *Price* 10*s. net.*

The Year-Book of the Scientific and Learned Societies of Great Britain and Ireland: A Record of the Work done in Science, Literature and Art during the Session 1908-1909. Twenty-sixth Annual Issue. Demy 8vo. Pp. vi + 356. (Compiled from Official Sources.) London: Charles Griffin and Co., Ltd., 1909. *Price* 7*s.* 6*d. net.*

Hazell's Annual for 1910: *A Cyclopædic Record of Men and Affairs for use in* 1910. Edited by Hammond Hall. Crown 8vo. Pp. lxiii + 608. (Twenty-fifth year of Issue.) London: Hazell, Watson, and Viney, Ltd., 1910. *Price* 3*s.* 6*d. net.*

Sudan Almanac, 1910. Compiled in the Intelligence Department, Cairo. London, 1910. *Price* 1

Publishers forwarding books for review will greatly oblige by marking the **price** *in clear figures, especially in the case of foreign books.*

THE SCOTTISH
GEOGRAPHICAL
MAGAZINE.

THE REGIONAL POPULATION GROUPS OF ATACAMA.[1]

By Isaiah Bowman, Assistant Professor of Geography at Yale University.

(*Continued from page* 9.)

The Copiapó-Coquimbo Region.

The classic description of the southern end of the great coast desert is that by Darwin,[1] whose notes, although written in 1845, are more illuminating to-day than the hurried observations of all others who have since written of this land. It is customary to write of the desert section of Chile as a country of interest only through its mineral resources of nitrate, copper, and tin. This treatment ignores the populations of greatest anthropo-geographic interest—the isolated, unaffected, local groups of indigenous peoples who cling to the watered areas of the desert. Except for slight and obvious modifications, Darwin's description is applicable to the country to-day.

Valparaiso, or Valley of Paradise, practically on the southern border of the desert, was so named because it was the first green valley seen from the Spanish caravels as they coasted south from Callao. Yet it, too, is a land of uncertain rain, and that joyful designation of its first white visitors would have been more abidingly true had it been reserved for one of the happier valleys farther south. The winters are frequently so dry as to injure the pastures, although this is the rainy season of the year, while the rainless summers wither the grasses and give the whole countryside a parched and brown appearance. The Valley of Paradise is,

[1] *A Naturalist's Voyage*, p. 323, *et seq.*

therefore, an intermediate tract receiving uncertain quantities of winter rain, a border region looking on the one hand toward the better-watered southern valleys, on the other hand toward utter desert, the region to which Darwin said he was tired of applying the epithets "sterile" and "barren."

Between Quilimari and Conchali, sixty odd miles north of Valparaiso, the country becomes more and more barren. In the valleys there is scarcely enough water for irrigation, and the intermediate land is so bare as not even to support goats. A thin sprinkling of vegetation appears only in spring after the winter showers. The cattle are then driven down from their summer pastures in the higher Cordillera to graze for a time on the meagre fields of the desert. Although Conchali is but a degree north of Valparaiso its rains are not expected to begin till the end of May, whereas at Valparaiso some rain generally falls early in April. As the time during which the harvest rain falls is limited pretty closely to the height of the winter season, which, in the desert and the mountains, corresponds closely to the time of the winter solstice, this late beginning of the winter showers is a sufficient index of the small total precipitation.

At Coquimbo, farther north, the rains are still lighter. The farmers break up their ground after the first shower, sow their seed if a second occurs, and if a third shower falls reap a good harvest in spring. The farms on the sea-coast are more fortunate than those up the valley, for the cooler and more humid atmosphere retards the evaporation of the precious rain. Ten days after a shower all the hills are faintly tinged with green, the grass being sparingly scattered in hair-like fibres a full inch long, whereas before the shower the surface appeared as bare as a highway.

In the Guasco Valley, latitude 28° S., to the north of Coquimbo, rain is practically absent for three or four years in succession, only one or two showers falling during that time. A rainy year generally follows this dry period. The rains may then do more harm than the drought. The rivers swell and injure the irrigating ditches, strewing great banks of infertile gravel and sand upon the cultivated terraces. The Guasco Valley is typical of many of these desert valleys in having a line of towns along it. At the mouth there is the desert port, without any water in the immediate neighbourhood; five leagues higher stands Feyrina, a long, straggling village; ten leagues farther is Ballenar; and above this the horticultural town of Guasco Alto, famous for its dried fruit. The towns are supplied with water from the melting snows in the far-distant Cordillera, and their fortunes are thus bound to the vicissitudes of the mountain storms and the changing temperatures. Heavy snows, with high temperature succeeding, mean prosperity and happiness in the valleys: the time of light snows is the time of want. In these valleys of Copiapó, Huasco, and others adjacent, the inhabitants watch a storm over the Cordillera with great interest, as one good fall of snow provides them with water for the ensuing year. Without snow, desolation extends throughout the valleys. Several times before mining development began, nearly all the inhabitants of the valley of Copiapó

were obliged to emigrate to the south. Darwin states[1] that, in the year of his visit, there was plenty of water, and each man irrigated his ground as much as he chose, but that frequently it had been found necessary to post soldiers at the sluices to see that each estate took only its proper allowance. The valley was then said to contain 12,000 souls, with produce sufficient for three months only, the rest of the supply being drawn from Valparaiso and the adjacent valleys of Chile.

Every winter the inhabitants hear with envy of the rains to the south, and hope, without fail, for a share in the good fortune of their neighbours, even though their hope is seldom realised. For a moderate rain is a distinct addition to their mountain supply. It falls alike upon the valleyside farms of the poor and the valley bottom lands of the rich, and means relative plenty for all in the year to come. Even the mendicant shares in the general happiness, as the more bountiful harvest is reflected in the increased generosity of his prosperous patron. The chief advantage of the occasional rain is not, however, in the water it supplies to the valleys but in the pasture it creates afield. The cattle and mules then range over the desert and the lower slopes of the mountains and, for a time, relieve the valleys of the burden of their subsistence.

Darwin also notes[2] the belief of the inhabitants in some connection between earthquakes and rain. It is the more interesting in this locality because the extreme infrequency of rain reduces the probability of accidental coincidences. Furthermore, rain sometimes follows earthquakes at the dry period of the year when the rain is a greater prodigy than the earthquake. To the minds of the inhabitants an earthquake foretells rain as surely as rain foretells abundant pasture. On Darwin's mentioning the shock at Coquimbo to the people of Copiapó they immediately cried out: "How fortunate! there will be plenty of pasture here this year."[3]

The intermediate part of the west coast desert, which is most arid and inhospitable to man, is typified by the conditions that exist in the desert of Tarapacá which, with Atacama, constitutes the northern half of Chile. Considered from the standpoint of man it is even more interesting than are the ends of the desert where the transition is made to more favoured lands. The study of this section of the desert and the relation of its people to the sea and the Bolivian hinterland was one of the chief objects of the Yale South American Expedition of 1907.

The Tarapacá Region.

It is the special quality of the desert of Tarapacá that, in general, its eastern marginal streams from the high Andine plateaus and mountains do not, as elsewhere on the desert on the west coast of South America, reach the Pacific. From the geomorphologic standpoint, it is the only truly desert portion of the entire arid coast. For a desert, in the geomorphic sense of the word, is defined as a region of interior basin drainage whose streams at first discharge centripetally with respect to the initial basins to which they are tributary, this condition being followed by drainage

[1] *A Naturalist's Voyage*, p. 336. [2] *Ibid.*, p. 337. [3] *Ibid.*, p. 337.

integration and desert levelling. While this definition of the desert is, in general, appropriate enough in the interpretation of desert physiography, there are very important exceptions. Along much of the west coast of South America, save for that small portion east of Iquique and a few hundred miles long north and south, the desert of Tarapacá, the pronounced westward slope of the western margin of the uplifted peneplain now constituting the Maritime Andes, has completely overcome the effect of the minor deformations. It is these minor irregularities that, with a less pronounced regional slope, generally give rise to a system of interior basins with characteristic centripetal drainage. The entire coast, from Payta, in northern Peru, to Valparaiso, in central Chile, with the single exception of the Tarapaca region, is, therefore, characterised by the absence of interior basins, notwithstanding its almost absolute aridity. It is, indeed, a desert in the truest sense of the word if we define the desert, as it should be defined, not with respect to geomorphic conditions wholly, but also with respect to those conditions of water supply which lead to the development of a sparse and specialised population. The geomorphic considerations are of great value, however, as they lead us to grasp the more readily the nature of structure and topography and their controlling influence over the space relations of streams, mountains, and sea. Throughout the desert on this west coast of South America the rivers, though more or less intermittent, in general reach the sea; the drainage is, in general, at right angles to the shore line, not centripetally arranged; the population is oriented with respect to the coast and the coast valleys, not with respect to a system of interior basins; the sea, not a line of oases, is the great highway of the region, the great unifier. The only exception is the desert of Tarapacá.

If we contrast Tarapacá with that portion of Atacama in central Chile, we see that the latter has a valley system related to the sea, and that the last important valley toward the north from the southern end of the great coast desert is Copiapó. From this point on, the streams of the Maritime Andes are lost in a line of salars or salt-encrusted plains, occupying the broad depressions, the interior basins between the low coast ranges and the foot of the Cordillera. The sole exception is the Loa River north of Antofagasta, whose more important features will be set forth in detail in a later paragraph. From the mouth of the Copiapó toward Antofagasta only one short, unimportant stream, fed from the trifling and uncertain showers that fall in the Coast ranges, descends precipitously to the sea. It occupies the miserable little valley of Paposo, 25° S., and is a fit ending to this line of dwindling streams. The only vegetation found north of this wretched valley is that already described as occurring at the level of the cloud canopy that hangs over the edge of the land. At this level, tiny oases may occur if the situation is peculiarly favourable. Thus, eight miles back of Antofagasta, at an elevation of 1600 to 2000 feet, is a bright little spot of grass and flowers caused by the heavy dews and mists. Some goats are raised, and even a few vegetables. The goats sip the dew from the spoon-shaped cactus leaves in which it gathers, a spoonful or more, in each. What with this and an occasional drink of salty water from some stagnant pool they are able to exist.

Toward the north, the streams of the Maritime Andes find the sea again at Pisagua, where the volcano-crowned plateau swings toward the west. Thus, for 500 miles from Copiapó to Pisagua, the Loa is the only river of any consequence that reaches the sea, and it accomplishes this only in years of heavy snowfall in the mountains. In all this stretch of desert the coast ranges are thus broken but once. The mountain streams dwindle and fail on the inner side of the desert, where their waters are absorbed by the deep porous sands and gravels that form a piedmont slope 350 miles long.

Each failing stream—Aroma, Tarapacá, Huaschiña, Mamiña, Quisma, Salado, Huataconda, Chacarilla, and others—is the locus of a village or a line of villages. Each stream is deeply incised below the level of the broad slope that directs it westward to the inner eastern edge of the desert. Thus there are two chief classes of routes of travel: east-west routes along the axis of the incised streams; and a north-south route at the inner edge of the piedmont where the streams terminate. The trails are for this reason arranged in a roughly quadrilateral fashion. Within the mountainous area of the plateau, where numerous volcanic peaks occur, the trails are more irregular in direction, but along the inner (eastern) edge of the Maritime Andes the bold scarp, which forms the western limit of the central salars of Bolivia, again determines a north-south highway of travel and trade. Departures from this quadrilateral pattern are numerous, but the travel over them is in general much less than over those arranged in conformity with the major topographic and drainage outlines. In addition, the departures are difficult trails, which zigzag up and down steep-sided and deep quebradas or gorges and often traverse the most difficult sandy wastes.

An examination, either of the history or the present condition of the villages occurring at the mouths of those valleys having a permanent water supply, leads to the conclusion that they, of all the desert places of South America, have been bound to the wheel of physical circumstance. In no other localities have the local times and seasons been so clearly reflected in the fortunes of the people. Elsewhere there have been means of escape if Fortune frowned too sternly, as when the inhabitants of Copiapó three times emigrated to the south. But Copiapó is in touch with the sea—its valley opens out upon the coast. On the other hand, so far as these interior villages were concerned, the coast might as well be a thousand as a hundred miles away. Their streams wither far from the sea, and naked desert and an uninhabited coast repelled all occupation or movement in that direction. The fortunate places were in the mountains and on the inner edge of the desert, away from the sea. And there they are to-day for any population unit which must subsist upon what it produces from the soil. Before nitrate and copper were produced and the modern artificial coast towns—Iquique, Pisagua, Tocopilla, Culeta Buena—came into existence, the coast ranges and the wellnigh impassable desert, intervening between them and the Andes, might have been a great continental desert interior, like "The Dead Heart of Australia." Its effect could have been no greater upon these inner desert towns. They looked to the mountains for their subsistence, not to the

sea. It was of the more importance then that the winter's snows, whose amount they marked with great concern, should be unfailing, than that the vessels of distant ports and countries should ride at anchor off their repelling and distant shores. Incredible as it may seem from an examination of a small-scale map of South America on which these towns appear almost on the coast, it is yet true that before the nitrate business was established, the isolation of these towns was almost as complete, their communication with the sea almost as remote and unimportant as is that of the similarly located piedmont towns of the northern slopes of the Kuen-lun and Altyn Tagh Mountains of central Asia so graphically described by Huntington.[1]

The sea and the desert were one in the absence of any easy means of securing food from them. And the oases, separated by wide stretches of utterly barren rock and sand, were like oceanic islands in the degree of isolation they possessed. In them no single movement of any consequence was ever originated. Economically they are the least important units in Chile. Their chief consequence to the world of progressive men has been their service to land travellers, who have utilised them as links in the chain of communication from central Chile to southern Peru, and from the mountainous hinterland to the coast. For example, they were determining forces in the extension of the Inca Empire. Their absence would have meant a more northerly frontier. They furnished food and water and men to the imperial armies, and constituted bases of operations in the progressive conquest of the southerly lands. They were population units incapable of any initiative and only passively and, in a certain sense, unconsciously serviceable to movements initiated in less hospitable regions near by. Almagro's army would have perished to a man, as, without ships and with an uncharted ocean of sand and salt before them, they made their precarious way northward from central Chile, had it not been for the occasional oases scattered along their line of march. The prospectors of a later day and the traveller of the present use them to similar purpose. Without them the desert would not be traversible except at enormous expense of money and energy and time.

It is quite commonly supposed that in every desert where people reside there is subsistence for beasts beyond the margins of the oases. It is easy to see how this supposition originated. From the earlier generalised picture of the desert as a rainless, unpopulated, sandy waste, some have turned to another scarcely less inaccurate, that represents all deserts as habitable places with sufficient drought-resisting vegetation scattered about to sustain at least a pastoral population. What both conceptions lack is an appreciation of the variety that deserts, as all other lands, display in the matter of habitability. It was believed after Frémont's exploration in our South-west that "The Great American Desert" was one of the formidable deserts of the world; later study of the whole, and the partial occupation of exceptionally well-favoured areas within it, have led a considerable body of loose writers to discard the phrase entirely and look upon the whole of our vast public domain

[1] *The Pulse of Asia*, p. 153 *et seq.*

in the West as habitable. Yet there are 70,000,000 acres of intensely desert land[1] there to-day not reclaimable even for grazing by the existing resources of science. Likewise in the case of the Sahara some have expressed too emphatically its universally desert character, a too hasty generalisation based on an intenser study of and greater familiarity with the uninhabited places. To this the recent works of Gautier and others have supplied a useful warning in pointing to the large inhabited areas,[2] not to mention the ultimately inhabitable regions not yet occupied by man.

It has already been noted that no vegetation can be found between 2000 feet and 8000 feet, in these portions of the deserts of Atacama and Tarapacá, except where the mountain streams debouch upon the piedmont slope. It is a thoroughly plantless region; not even that almost universal sign of the desert, the cactus, can be found; downright nakedness prevails. This complete barrenness of the desert pampa, outside the borders of the oases, renders even pastoral occupations impossible over the wide expanses of the region. Flocks are kept in certain numbers, but they must be fed on the cultivated plants of the garden farms: alfalfa, millet, etc. Not even the temporary desert vegetation noted at Payta and Copiapó, and due to an occasional shower, exists here. Beyond the oases there is nothing, except in the mountains above 8500 feet, and access to these exceedingly thin mountain pastures is denied over much of the year by the extreme scarcity of springs and streams that may be relied upon for drinking water. Only during a few months of the spring can certain restricted areas of mountain pasture be relied upon. Of other pasturage there is none except in some under-developed oases where poorly watered marginal tracts, rarely more than a few square miles in extent, support a wild growth of temporary grasses and perennial shrubs which, for a short time, bear certain quantities of succulent foliage.

The population, by reason of its aloofness from the ocean and the lack of herbage afield, is sedentary to a degree. It consists of farmers deeply rooted to that portion of the soil watered by the mountain streams. Each agricultural or horticultural area is to a high degree a self-centred unit. Formerly this quality was much more evident than now. To-day the great industrial development which the exploitation of the nitrate has brought about has stirred the oases dwellers out of their lethargy. Fruit is required at Iquique, and Pica and Matilla supply a part of it, and thereby acquire a taste for the products of the town. Labourers are in high demand all through the nitrate region, and the populations of the oases, crowded from the standpoint of water-supply and food resources, are often drawn upon for the service of the nitrate oficinas or establishments.

Yet the material independence of the oases peoples is clearly persistent to a certain degree even to-day. It is a product of the wide spaces between population units. No better example could be cited of man fighting sheer space, with less to be gained at the end of the

[1] *Irrigation in the United States*, F. H. Newell, 1902, p. 28.

[2] "The Desiccation of North-Central Africa," The Monthly Record, *Geog. Journ.*, June 1908, p. 676.

fight, than here. When one conquers the waste spaces of the sea he has, within certain rather wide limits, his choice of lands to touch and products to secure; but here, a similar climate and similar conditions of soil and water-supply are reflected in a damning uniformity of agricultural products. The clearest working of the economic law this embodies is seen in a year of misfortune at any one of the oases, the adjacent ones experiencing a normal year. Thus a dam sometime breaks, and the accumulated waters rush through the fields and terraces of the intensively cultivated valley and wash out a large share of the crops for the year. The emptied reservoir remains dry until the following season and discomfort, if not actual want, prevails in the valley. The thinkable consequence of this condition is that the surplus products of a neighbouring valley are brought to the stricken group. Instead, the long distance to be overcome and the consequent high cost of transportation to be met by the consumer all but forbid such a course. The consumer has no resources to speak of and must buy cheaply or not at all. He can endure want, but he cannot buy what he has no money to pay for and he has no way of getting money.

There is clearly in this case a relative economic loss and in some cases the loss is absolute, as when an unused surplus of perishable fruit or bulky forage is not sold to a neighbouring valley.

As a consequence of the wide spaces to be overcome with perishable or bulky goods, or even with any goods at all, the prices for staple commodities vary greatly from place to place. In May 1907 we found free pasture at the uninhabited grassy camp known as Chaia, a tributary of the Chaqarilla gorge: at the oasis of Chaqarilla, a half-day's journey west, forage was free, if the natural growth was desired, and a few shillings the quintal, if it consisted of barley from a cultivated terrace; while at Pica, 30 miles north-east, it was 8 pesos, or $2 gold, per quintal. Where there is none to spare sometimes money cannot buy forage even of the worst kind; where there is plenty, it is very cheap; where there is a surplus it is given away, and where there are no inhabitants it belongs to the first comer. It is the ratio of supply to demand at a given restricted and isolated locality that determines the price, not the ratio of the aggregate supply to the demand of the whole geographic province. In short, there are no railroads and only the most primitive means of carriage for freight and passengers; and no specialised production or adequate equalisation of surplus products of any kind. Furthermore, these primitive means of communication mean great expense. The prices for food, fruit, forage, and the like are as high in many places as in New York City. The price depends on the locality, the extent to which the commodity is locally produced, and the degree of abundance of the crop for a particular year.

In general, one must grow one's own produce or live very expensively. A wine produced at Pica, Chile, can be purchased for a fraction of a dollar a bottle; imported wines cost, if one can get them at all, nearly $2 per bottle. In Italy or France one can purchase flask and wine of precisely the same kind for a few cents. Only a rich mine or a thriving business enables one to live permanently upon the market

and not have one's own vine and fig tree. To the costly and hazardous transportation and the fact that each man lives for the production of his own food there is added the necessity of overcoming the inertia of the native. He has no ideals of the sort we know and live for. Wealth to him is the possession of comfort of a sort we would regard as miserable. Drink, gaudy attire, and long leisure to enjoy them, are in a way objects of veneration to many of the Indian inhabitants and, in a large measure, it is true that only for them and for the sterner necessities born of the meagre years will they produce, even for pay, what another man is to consume.

It may, therefore, be said that in general the commerce of these towns is decidedly feeble; it is carried on under great difficulties and tends toward no natural self-initiated improvement, but rather stagnation, because the products are, on the whole, not of a complementary nature. The interchange of products is only important under fortuitous or local conditions, as when clay deposits occur at one locality and not at another, and so lead to the production of pottery; or where the culture of the grape is happily joined in one place to a good water-supply, and the production of exceptionally good wine thus becomes a tradition. At present there is also a certain activity due to the opening up of mines in the mountains. The surplus products of the oasis of Chaqarilla are disposed of at the Victoria mines, a few miles away, while some fruit and dried meats are taken from Pica and Matilla to the mines at Huataconda and Chaiahuasi, a week's journey over a steep trail.

The precarious situation of most of the towns is one of their striking characteristics. The least accident may betray them. This is well illustrated by the history of a line of settlements in the Chaqarilla Valley. It was at one time a fertile and frequently visited district. But in the early 70's, as nearly as we could determine, a great flood came down the gorge, broke down the irrigating ditches, cut up the terraces or deposited infertile sand, gravel, and even boulders upon them, overwhelmed orchards, and so generally devastated the farms and discouraged the inhabitants that all but a remnant of them moved away. Their irrigation works may still be seen at the site of the now deserted village of Algorrobal. Here and there a neglected orchard tree or pepper bush, struggling along as best it can without irrigation, or the crumbling mud walls of some abandoned home are a mournful testimony to the ruin wrought by the flood in this once happy valley.

The fragment of people now living within sight of the former more populous valley occupies a safer position. The tiny oasis of Chaqarilla is perched high above reach of flood upon the slopes of a terraced alluvial fan, whose outer edge is protected by a stone wall. The small spring-fed stream discharging across the fan is led out upon the gardens and orchards by half a hundred diverging canals. Before the mines were opened it was a lonely spot, and it is said that it was once attacked by robbers from the pampa to the west. It was supposed that stores of treasure had been accumulated from the mysterious mountains behind. Nothing, however, was found, and the murder of most of the inhabitants was but a dismal butchery.

The future of these piedmont and mountain valley towns is safely predictable. The small area of irrigable land, even with the maximum conservation of water supply, means definitely restricted groups of population widely separated from each other and as stagnant and self-dependent as they are isolated. Their limited development and the wide unproductive spaces to be overcome will always mean the absence of any improved means of communication, and no assistance can be expected in this direction. Railroads will never connect these towns except as they lie by chance upon the line of some future route between mine and seaport. Pica is the largest town along the mountain front, and a branch line but fourteen miles long would put it in touch with the port of Iquique *via* the Lagunas Iquique nitrate railroad. Yet that short line has not been built, and probably will never be built. Consequently, the outlook for the smaller towns in remoter localities is that of a continuance of the present economic state unless they are fortuitously assisted by roads built to the mines or are stimulated by the demands of adjacent mines, the exceptional richness of whose ores might render possible the costly transportation by carts and mule packs to the coast. The latter means are not found generally successful to-day with competing mines more favourably located with respect to railroads. The mines behind Taltal, which for a long time exported their ores by cart to the seaboard, had to be abandoned when the mountain railroad from Antofagasta to Oruro was completed. The future of mining in this part of South America must be bound up with the future railroad development of the country now that railroad building has been actually begun. Before any railroads at all were built, or when only a few were completed, such competition could be continued. With the active extension of the railroads in South America, that phase of mining development has wellnigh passed. The remote, isolated, self-dependent, desert village is therefore a permanent feature. The traveller of a century hence will still find certain groups unaffected, in the main, by the industrial development of the mines and the nitrate deposits of the desert of Tarapacá.

In spite of the disagreeable odours and the filthy sights one sees about these towns, one's first and last impression of them is enduringly pleasant. From the desert trail, long, hot, and deep in dust, their inviting gardens are seen many leagues away, and at night a tower light on a commanding hilltop guides the traveller to their hospitable gates. Rows of refreshing orchard trees, neat squares of vegetable gardens, and a life-giving stream with clustering houses—that is the picture. In the twilight of morning and evening, the strong contrast of yellow plain and deep green foliage is most marked and lends to the view, in that otherwise cheerless land, an indescribable charm. There is a universal appeal in this aspect of home and a certain comfort and beauty amid the inhospitable surroundings of a naked desert.

Each town has its patron saint, appropriate to the specialty for which the town is known or the condition under which it exists. St. Andrew, the patron saint of wine, is the patron saint of Pica, where excellent wine is produced; San Isidro, the patron saint of farmers, is the patron saint of Canchones, where, without a surface stream, the farmers still

persist in agriculture by digging canals and great holes down to the ground water, in which they plant their grain and vegetables. Frequently the saint of one village is taken on a trip to a neighbouring village. Thus, at the time of our visit to Pica, the Virgin of Candelaria was brought from Macaya, a copper-producing village of 600 inhabitants sixty miles north-east of Pica. She came asking for alms, for it had proved a hard year at Macaya, and an appeal was thus made to the generosity of the inhabitants of Pica. Their patron saint was carried out to meet the visiting saint, and with fife and drum the united procession returned to the village, parading the streets to the church of St. Andrew.

Throughout many portions of this thinly populated, arid region of South America, there is a curiously interesting mixture of primitive and Christian worship. The old rites of the Indians are grafted upon a new principle, often with but a change in name and not in symbol. The spirit of the old prayers for abundant rivers and rich harvests breathes through the new devotions and the quaint, melancholy songs of the ancient Quichua or Aymara tribes often follow upon a fiesta in which the rites of the Christian religion are but new forms for an old and pathetically simple speech. The rivers and the harvests are the forms in which they understand the Deity. It is hard to teach men new faiths or religious or moral niceties whose first and only prayer has always been for the daily bread fairly wrung from a stubborn earth.

THE HUDSON BAY ROUTE TO EUROPE.[1]

By Robert Bell, I.S.O., M.D., LL.D., D.Sc. (Cantab), F.R.S., of Ottawa, Corresponding Member of the Royal Scottish Geographical Society.

(*With Map and Illustrations.*)

The question of a feasible route to Europe, from the prairie provinces of Canada, by way of Hudson Bay, is of the first importance to the Dominion, for several reasons. It is the shortest possible course from the centre of this group of provinces to Liverpool, as it follows approximately a segment of a great circle between these points. Not only is the total length the shortest, but this route affords a greater proportion of transportation by sea, with a shorter land haul than any other. More than a thousand miles of its water transportation is within the British possessions. Hudson Bay having only one opening to the ocean may be considered a *mare clausum*. The land portion is shorter than that by any existing line, and it passes through an even country with a very gentle slope towards the sea. The bay and strait are free from rocks and shoals and may be easily navigated by the largest ocean-going vessels.

The advantages of utilising this route have been discussed by public men and the press ever since Canada acquired the north-west territories

[1] A paper read before Section E (Geography) at the Winnipeg Meeting of the British Association, August 1909.

from the Hudson's Bay Company. On the other hand, a great deal of nonsense has been written and strong opinions have been given against the practicability of the route, mostly by people who had no personal or direct knowledge of the subject. The history of the question and the various circumstances connected therewith, all tended to prejudice the public against it. A constant effort was made to associate Hudson Bay and Strait with the Arctic regions. Although the bay stretches for a thousand miles from south to north and the distance is still greater from the Atlantic Ocean at the entrance of the strait to the western shore of the bay, yet these waters do not anywhere reach the Arctic circle and the latitude of the southern extremity is south of that of London. The writer has devoted about twenty-five seasons to the exploration and survey of the shores of Hudson Bay and the country lying to the south and west for long distances inland. He has passed through Hudson Strait nine different times and has surveyed a great part of its northern coast.

The Hudson's Bay Company, which had successfully used the route in question for more than two hundred years, regarded the bay and all the country extending thence to the Rocky Mountains as their own property and were jealous of any one intruding on their preserves, who might some day dispute their monopoly of trade or their ownership of the country. Not only did their officers and men and their supplies enter the country every year by this route, but the first military force and the first permanent settlers, in what is now Manitoba, came in by the same route. Viewed from the British Islands, it seemed by far the easiest and most direct way into the Canadian north-west.

Notwithstanding the fact that Hudson Strait and Bay have been navigated with success for two hundred and forty years by the company, there is no doubt that, in the old days of sailing ships, floe ice often retarded the progress of their vessels, and much has been made of this fact by the opponents of the proposal to use these waters as a highway to Europe. But steam navigation has changed all that and has put a new aspect on the whole question. The writer was a passenger on one of the company's sailing ships in 1880, when a small scattered field of ice entirely stopped our progress in the strait. Four years afterwards, when I was on board the steamship *Neptune*, in about the same part of the strait, we met a much worse field of ice and steamed through it with little or no loss of time.

The delay in attempting to develop this route for commerce has arisen from several causes, amongst which are the following: When it was first advocated as a modern commercial route, the population in the interior was so small that there would have been too little business to give employment to a railway and line of steamships. As soon as the Hudson's Bay Company territories had been purchased and the Canadian Pacific Railway had been constructed, both at the expense of the people of Canada, in order to secure the trade of the north-west for the older portions of the country, it was argued that it would be unwise to open a shorter and more direct route to Britain, which would divert the very trade and travel we were so anxious to obtain for that railway in order to secure these advantages for the Canadians themselves. It was there-

Station at Skynner's Cove, Nachvak Inlet, looking north.

Looking south up Nachvak Inlet from Skynner's Cove; s.s. *Neptune* in foreground.

fore natural that the proposed route should be opposed by the Hudson's Bay Company, the Canadian Pacific Railway, the manufacturers of Eastern Canada and all others who thought their own particular interests were menaced. The Canadian Government was also opposed to it, for the time being. In fact, the Hudson Bay route had few friends or advocates. The people of the western prairies, who wanted the route opened up, were not sufficiently numerous and had not the necessary political influence to secure for the project the consideration it deserved. No class of people of the eastern parts of the Dominion felt themselves called upon to take any active interest in the matter. And so this great question has dragged itself along to the present time. In the natural course of events, the opening up of this channel for trade could only become a living issue when the exports became sufficiently great to force their way to the sea by the cheapest and easiest route. When this shall have been accomplished, a large proportion of the imports will, of course, come the same way and there will also be a considerable passenger traffic. The people of Great Britain will soon learn that the increase in their own trade, which this route will afford, is a matter of much interest to them.

To an outsider, the virtual obstructions placed in the way of developing this route by such means as I have mentioned, will appear to have been short-sighted and unpatriotic; for let us suppose that if, by any means besides those which have been referred to, a large population could be rapidly poured into that vast uninhabited region, would this not be the very best means of furnishing the desired traffic for the Canadian Pacific Railway and sale for the tariff-protected Canadian manufactures?

Small as was the population of Manitoba, there was always a clamour from that quarter for some consideration of the Hudson Bay route by the Government. This was appeased by sending out a Hudson Bay expedition on several occasions and thus time was gained, to the evident satisfaction of the government of the day.

The writer accompanied three of these expeditions, as naturalist and geologist. On two of them he was also medical officer, but he was not asked to report anything as to the question of the suitability or otherwise of the strait and bay as part of a commercial route between our north-west territories and Europe. He had, however, previously written a number of papers on this subject for publication, including one for the geographical section of the British Association for the Advancement of Science, York meeting, and accompanied it with a map.[1] But his most complete paper in this connection was one entitled "A New Route to Europe" (from the interior of British North America), published in Montreal as a pamphlet in 1880. Much of the general literature on the Hudson Bay route which has since appeared is based on the information contained in this pamphlet.

In connection with the expedition of 1884 by the steamship *Neptune*,

[1] Published in the *Proceedings of the Royal Geographical Society*, New Monthly Series, vol. 111, 1881.

the Government arranged to send out six small parties to make meteorological and other observations, for one year each, at six stations, to be placed as three pairs on the opposite shores of Hudson Strait. One pair was to be at the entrance from the Atlantic, one pair on the north and the south side, midway up, and the third pair on each side of the outlet into the bay. All the stations were successfully placed where intended, except the one which was to have been built on the north side of the entrance. The weather and other circumstances prevented a landing being effected in this vicinity, and the station was built at Nachvak inlet, on the Labrador coast, about fifty miles south of the strait (see Plate I.). Small but comfortable wooden houses, each containing three good rooms, besides an attic, and having from one to three outbuildings, were erected for each station. The dimension timber, the sawn lumber and the doors and windows were taken out in the ship, but all the cutting and fitting were done after the materials had been placed on the ground. Only from two to three days were required to land the building materials, the fuel and supplies of all kinds for a year and to erect the buildings.

The officers and men left at these stations kept similar meteorological records in uniform sets of books. They were also instructed to ascend the highest hills near their stations, from time to time, in order to make telescopic observations on the condition of the strait during the winter months.

At the end of the first year, or in 1885, fresh officers and men were sent out on the steamship *Alert* to replace the first parties, who were then brought home. At the end of the next year the second parties also returned by the ship and all the stations were demolished, except that on Big Island, midway up the north shore.

It is to be regretted that, in neither year, were the officers in charge of these various stations asked to make reports on the results of their own observations during the two whole years and as to the information they obtained from the Eskimos. They were merely required to hand in their books of records, after which a general report, purporting to be based on all of them, was prepared by some one else for publication each year.

In 1897 the Canadian Government sent out an expedition by the steamship *Diana* to test the length of the season of navigation in Hudson Strait by making occasional voyages from end to end, beginning as soon as it could be entered and continuing till it might be closed by ice, as at that time it was supposed by many that such a thing sometimes occurred, although there was no proof that it had ever happened. But when the *Diana* reached the strait (on the 22nd of June) the entrance was already quite clear and no ice in sight, but our ship soon afterwards got entangled in ice by going too close to Big Island, about half-way up the north shore, and it was not ascertained whether or not she might have passed on into the bay by keeping the centre or the southern side. The strait was found to be clear of ice until the *Diana* left for Halifax late in the autumn.

The writer was a member of the *Diana* expedition, and by means of

HUDSON BAY ROUTE CHART ON MERCATOR'S PROJECTION

105
90
75
60
45
30
15
0
60
45
GREENLAND
Disko I.
Christianshaab
Baffin Land
Melville Peninsula
Davis Strait
Holsteinborg
Arctic Circle
Denmark Strait
Iceland
Reikjavik
Godthaab
Pack Ice
Frederikshaab
Hudson Strait
Julianshaab
C. Farewell
C. Chudleigh
Port Churchill to Liverpool 2 Miles miles
Liverpool to Quebec miles
Port Churchill
HUDSON BAY
C. Duffering
Ungava Bay
Hebron
LABRADOR
Nain
Hopedale
Hamilton Inlet
Str. of Belle Isle
ATLANTIC
OCEAN
DOMINION OF CANADA
SASKATCHEWAN
MANITOBA
ONTARIO
QUEBEC
NEWFOUNDLAND
Winnipeg
Gulf of St. Lawrence
St. Johns
Quebec
Montreal
Ottawa
Toronto
Halifax
Boston
New York
Philadelphia
Baltimore
Washington
Cincinati
St. Louis
Chicago
Detroit
Buffalo
Cleveland
Pittsburg
Richmond
Newport News
Wilmington
Charleston
Bermudas
Madeira
Azores
Flores
St. Michael
Boston to Gibraltar
New York
Baltimore
Hamburg to St. Thomas Colon
Hamburg to New Orleans
Outward Track 15th August to 14th January
Homeward
Outward Track 15th January to 14th August
Homeward
Lisbon
Oporto
Madrid
SPAIN
PORTUGAL
Gibraltar
Tangier
Fez
MOROCCO
Algiers
Tunis
TUNIS
ALGERIA
Bordeaux
Lyons
Marseilles
Paris
FRANCE
SWITZERLAND
Brussels
Cologne
Amsterdam
Rotterdam
Antwerp
Hamburg
Bremen
Berlin
Munich
Copenhagen
DENMARK
North Sea
Edinburgh
Glasgow
SCOTLAND
Belfast
Dublin
IRELAND
Liverpool
Manchester
Hull
ENGLAND
LONDON
Southampton
BRITISH ISLES
Bergen
Christiania
Trondhiem
Christiansund
Aalesund
Faroe I.
Shetland I.
Orkney I.
Stavanger
Aberdeen
Christiansand
Portland
Sydney
Halifax
Boston
Cobalt
Sudbury
Port Arthur
Duluth
Minneapolis
St. Paul
Winnipeg
Regina
Calgary
Edmonton
Battle Ford
Prince Albert
Saskatoon
Battleford
Qu'Appelle
Moose Jaw
Medicine Hat
Swift Current
Maple Creek
Lethbridge
Fort Macleod
Kootenay
Kamloops
Vancouver
Victoria
Seattle
Portland
San Francisco
Los Angeles
San Diego
Salt Lake City
Denver
Topeka
St. Louis
Santa Fé
Little Rock
Memphis
Atlanta
El Paso
Omaha
Chicago
Milwaukee
London
Detroit
Buffalo
Niagara
Albany
Cleveland
Pittsburg
Portland
Mt. Desert
Sable I.
Yarmouth
Fredericton
St. John
St. John
Sydney
Prince Edward Island
Anticosti
Mingan
Seven Islands
Lake St. John
Lake Temiscaming
Lake Nipissing
Lake Superior
Lake Winnipeg
Lake Manitoba
Lake Winnipegosis
Lake of the Woods
Rainy Lake
Lake Athabasca
Great Slave Lake
Great Bear Lake
Mackenzie R.
Peace R.
Athabasca R.
Saskatchewan R.
Red R.
Assiniboine R.
Missouri R.
Columbia R.
Fraser R.
Yukon R.
Mackenzie R.
Back R.
Baker L.
Chesterfield Inlet
Southampton I.
Repulse Bay
Wager Inlet
Fullerton
Churchill R.
York
Nelson R.
Severn R.
Albany
Moose R.
Abitibi
Lake St. John
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Southampton I.
Repulse Bay
Wager Inlet
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York
Nelson R.
Severn R.
Albany
Moose R.
Abitibi
C. Jones
James Bay
Ekwan R.
Winisk
Attawapiskat
Albany
Moose R.
Mattagami
Missanabie
Sault Ste. Marie
Michipicoten
Nipigon
Port Arthur
Rainy River
Lake of the Woods
Winnipeg
Regina
Moose Jaw
Medicine Hat
Swift Current
Maple Creek
Lethbridge
Fort Macleod
Calgary
Edmonton
Battle Ford
Prince Albert
Saskatoon
Battleford
Qu'Appelle
Kootenay
Kamloops
Vancouver
Victoria
Seattle
Portland
San Francisco
Los Angeles
San Diego
Salt Lake City
Denver
Topeka
St. Louis
Santa Fé
Little Rock
Memphis
Atlanta
El Paso
Omaha
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Milwaukee
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Albany
Cleveland
Pittsburg
Portland
Mt. Desert
Sable I.
Yarmouth
Fredericton
St. John
St. John
Sydney
Prince Edward Island
Anticosti
Mingan
Seven Islands

a yacht, carried out to Big Island on the deck of the steamer, he surveyed a considerable portion of the north shore of the strait, which forms the south coast of Baffin Land.

Against the Hudson Bay route, it is urged that the season of navigation is too short, because people erroneously suppose that the strait is frozen over during the winter and that Churchill Harbour, on the west coast of the bay, the only natural port known to be available for large vessels, is not clear of ice for a sufficient length of time each season. The harbour is, however, open for about four and a half months during the summer and autumn, and this period might be considerably lengthened by artificial means.

From the land side this harbour may be difficult to approach by a railway on account of extensive bogs or "muskegs." The writer in 1879 surveyed the Churchill River, from a point a long distance inland, all the way to the mouth, and also the harbour itself. I have entered this port by sailing ships, and I had the honour, in 1884, of piloting the first steamship that ever entered it.

By prolonging the railway northward up the coast, a salt water harbour may perhaps be found which is open during a longer season than Churchill, while the total distance might be only slightly increased.

The name "Port Nelson" has been retained by map-makers for the mouth of Nelson River, perhaps because, on paper, it looks as if a port should still be there, but in reality no port for seagoing vessels exists at this locality at the present day. It is recorded that some of the small vessels first sent out by the Hudson Bay Company two hundred and forty years ago, went to Gillam's Island, which is now just above the tide water at the mouth of the river. The writer has ascertained that the land on the west side of Hudson Bay is, geologically speaking, rising very rapidly, apparently at the high rate of nearly five feet per century.

Thirty years ago, or in 1879, I examined carefully all the waters in the vicinity of Gillam's Island, and took many soundings, especially around this island itself, and nowhere could I find a greater depth than ten feet. Although the island is now above the level of the highest tides, it is probable that at the time of Raddison, the water around it would be twelve feet deeper, making a total of twenty-two feet, which would be quite sufficient for the ships frequenting Hudson Bay up to the time of the adventures of D'Iberville in these waters. The Nelson descends with a swift current to high-tide level at the foot of Gillam's Island, and from this outward the principal single discharge of the river water into the bay, at low tide, consists of a narrow, shallow, and very crooked stream, running for miles through the great mud flats which fill the estuary, and interrupted throughout by many large boulders.

The Inner Ship's Hole, in front of York Factory, in the mouth of Hayes River, is not deep enough for vessels drawing more than eight feet. In 1880 I sailed from this anchorage to London in the Hudson Bay Company's barque *Ocean Nymph*, which required only this depth of water, and it was only by the most careful piloting, at the top of high tide, that we managed to get out to sea, a distance of twenty miles from the factory.

Forked Fall, 468 feet high. North side of Hudson Strait.

Looking south from head of Cayoo Inlet, north side of Hudson Strait.

A very short outline should here be given of the geography and the leading physical features of Hudson Bay and Strait. The former is fully six hundred miles in width, the area being nearly half that of the Mediterranean of the old world. James Bay, which constitutes its southern portion, measures 350 miles from north to south by 150 miles in breadth, and has an area more than 50 per cent. greater than that of Lake Superior. Having these large dimensions and being situated in the heart of the continent, Hudson Bay is the most striking feature in the geography of North America, and the writer long ago suggested that it might be more appropriately and correctly called Hudson Sea, being, as it were, the Mediterranean of this continent. It is separated from the ocean by a very long strait and is really a *mare clausum* surrounded by British territory. Roughly speaking, Hudson Strait measures 500 miles in length by 100 miles in width.

A very large extent of country immediately around Hudson Sea, on the east, the south, and the west, drains directly into it by upwards of thirty good-sized rivers and innumerable smaller ones. The great drainage system tributary to the Manitoba lakes forms a supplementary basin, which derives its waters from all sides and sends them to the sea by a single trunk stream, the Nelson, one of the great rivers of the world. The Saskatchewan, which falls into Lake Winnipeg, originates west of the Rocky Mountains, and has a course of more than a thousand miles. The Winnipeg River, one of the largest tributaries, rises near Lake Superior, and flows westward into the south-eastern bay of Lake Winnipeg. The Red River, the most southern affluent of Lake Winnipeg, has its source south of latitude 45 degrees. This, with the tributaries from the north, or opposite direction, gives a total north and south drainage of 1500 miles. The limits of the basin of Hudson Sea, therefore, extend from the centre of the Labrador peninsula west to the Rocky Mountains, a distance of 2100 miles, and from the source of Red River and the height of land near Lake Superior, northward to Repulse Bay, a distance which is equally great.

Hudson Sea and Strait are both easy to navigate. The former has an average depth of seventy fathoms, deepening to one hundred, towards its outlet. The west end of the strait has a depth of 150 fathoms and increases regularly to 300 as its enters the Atlantic. There are many good harbours on both sides. The bottom in all cases is stiff boulder clay, affording good holding ground. The land on the southern side rises to heights of from 1000 to 2500 feet, and is more precipitous than on the northern side, the western half of which is not so high as the eastern. A few light and signal stations might be erected on elevated points, which could inform passing ships as to the position of any ice that might be in the strait. Both sides could be easily and effectively lighted at a very small expense.

The country on the eastern side of Hudson Sea is much higher than that on the west. From Cape Jones, on the east shore, where James Bay widens into Hudson Sea, to the north, all the way to Cape Dufferin, the east coast rises to a height of about two thousand feet, and in parts is quite precipitous. The west side is everywhere low, with shallow

water, from the southern extremity of James Bay nearly to Chesterfield inlet.

None of the rivers of the east shore are navigable except for light canoes between the portages, but some of those coming from the west might be navigated during high water by steamers with powerful machinery. By such craft the Moose and its west branch, the Missinabi, might be ascended for 130 miles from the sea, the Albany and the Attawapiskat, to the north of it, each for 250 miles, the Kapuskow, between these, for 50 miles, the Ekwan, Wenusk, Severn, and the Hayes, together with both its branches, the Shamattawa and Steel rivers, for about 130 miles each, and the Nelson for 70 miles above tide. There is a rapid at the head of the tidal lagoon of the Churchill, but a strong steamer might ascend this at high-water, in which case the river might be navigated for about a hundred miles, or to the mouth of the Little Churchill. The Harricanaw River, which enters the southern extremity of James Bay, might be utilised for eighty miles up from its mouth during high-water, but it is extremely shallow during the summer. In the central sections of this river and also of the Nelson, some stretches are navigable for steamers for many miles. In the event of steamships running into Hudson Sea, the rivers I have indicated may be used for bringing the produce of the country to the coast for shipment to Europe or elsewhere. The small harbours at the mouths of these streams have an average depth of only about ten feet at high tide.

The mean rise of the spring tides on the west side of Hudson Sea is eleven or twelve feet, and is pretty uniform, but it diminishes somewhat as we go south. At the south end of James Bay, when a northerly wind blows at the time of spring tide, the water sometimes rises to nearly double the ordinary height. The greatest spring tides are at the mouth of Nelson River, where they rise fifteen feet. The tides are low all along the east coast. In the eastern half of Hudson Strait the tides are very high, but towards the west end they diminish very much. At Ungava Bay, just within the entrance and on the south side, some tides may rise to a height of fifty feet. At Fort Chimo, twenty miles up the Hudson River, Commander Bolton, R.N., found a tide of 38½ feet. At Ashe inlet, on Big Island, the average spring tide was ascertained accurately to be 31 feet.

The resources of Hudson Sea and of the adjacent regions, from which exports may be expected in the future, include timber, minerals, agricultural produce, fish, fur, and oil. These may some day furnish considerable business in addition to the great traffic passing through the sea from the regions west of Lake Winnipeg.

It is probable that nothing but experience gained after the opening of the Hudson Bay route will dispel the bugaboo as to the ice and the supposed impossible climate. Not only has it been supposed that the strait is closed during the winter, but that the sea itself freezes across. A little reflection would convince any one that this is quite impossible with a body of salt water 600 miles wide and a thousand miles long, within the latitudes of the British Islands. It is equally impossible for this to happen to a deep channel like the strait connecting this great sea

Typical small iceberg, at north side of eastern part of Hudson Strait.

The Arctic in Marble Island Harbour, looking north.

and the Atlantic Ocean, and having a strong tide swinging rapidly through it twice every twenty-four hours. The presence of so much open water and the lower altitude give Hudson Sea and Strait a milder winter than that of Manitoba or Minnesota.

The writer has in his possession a record of the climate, including seasonal and periodic events, for nearly a hundred years at an inland post on the Albany River. This gives an average of six months of open water each year. Another record kept at York Factory for fifty years shows an average of fully six months of open water in the year. The difference in latitude between York Factory and Churchill Harbour is only about one hundred miles. As neither Hudson Strait nor Sea is frozen over at any time, they might be navigated for six months or more in the year, but the season of navigation should only be reckoned as the period during which vessels could enter a suitable harbour.

Much has been ascertained in the last thirty years, and a great deal had been previously recorded since the Danish captain, John Monck, wintered at Churchill in 1619-1620, to show that this harbour has an open season averaging four and a half months in the year, or from about the middle of June to the end of October, and there is no doubt that a powerful ice-breaking steamer, such as some of those used in Russia, could materially extend the time of open water, both in spring and autumn, and the clear open sea being just outside, could always be utilised. We need not, therefore, despair of navigating these waters on account of the shortness of the season.

The fact that the strait and this great inland sea have been navigated by sailing ships with scarcely any loss for two hundred and forty years, for the sake of the small business available, shows what might be done when a great carrying trade is in sight. If railways were built from the prairie provinces to Hudson Sea, the farmers of these regions would be in as good a position in regard to a seaport as those of the inter-lake peninsula of Ontario are in relation to the St. Lawrence. If the average price of wheat throughout the north-west were increased by ten cents a bushel, owing to such improved facilities for marketing it in Europe, and if only one-fourth of our 200,000,000 acres of good wheat land in the north-west, or, say, 50,000,000 acres, were producing this grain at the rate of twenty bushels an acre, the annual value of this crop alone would be increased by 100,000,000 dollars, or enough (at a moderate price) to build a new transcontinental railway every year. The combined value of all other products would double this amount, and the value of the land itself would be correspondingly enhanced. These advantages, together with the many others which would result from the greatly reduced rates for freight, would seem to justify the Canadian Government and people in at least making every effort to establish this line of transportation.

The city of Winnipeg is near the south-eastern corner of the whole area of the prairie provinces, and yet the distance from it to Liverpool by the Hudson Bay route is 800 miles less than by the St. Lawrence, while the saving of distance in favour of all other points is greater as we advance north-westward into the interior. This may be illustrated by

supposing that two travellers start for Liverpool from some point in that direction, one going by Lake Superior and Montreal, the other *via* Churchill; the latter will arrive at Churchill as soon as the other reaches Winnipeg. From Winnipeg this traveller has yet to go 1291 miles by Lake Superior to reach Montreal, where he will still be no nearer to Liverpool than the other is when he reaches Churchill. In other words, the traveller by Churchill saves the whole distance between Winnipeg and Montreal (see map, p. 71). By way of New York the distance is, of course, still greater.

It will probably be found that some of the products of the north-west, which it would not pay at all to send by the St. Lawrence, can be profitably exported by the Hudson Bay route.

For more than thirty years the writer has advocated the consideration of this route. In 1878 a paper which he had prepared on the subject was published in the report of the Minister of the Interior for that year. During the season of 1878-79 the Hon. Thomas Ryan called the attention of the Senate to the importance of this subject, and stated his belief that a railway might be advantageously constructed from Manitoba to Hudson Bay. In 1880 Parliament granted charters to two companies for building such railways, and in the following year one of them, the Nelson Valley Railway and Transportation Company (of Montreal) appointed Mr. George Bayne as its chief engineer and caused a survey to be made from Playgreen Lake to Churchill. The company also opened a right-of-way along its line for many miles.

The region between Lake Winnipeg and Churchill, which a railway would require to traverse, has been supposed to be hilly and rocky, but this is a mistake. In the wide valley of the Nelson River there is much good soil, consisting of a soft clay loam.

The railway might be originally constructed so as to be operated by hydro-electric power, which can be furnished on a great scale by the falls and chutes of both the Churchill and Nelson Rivers, and also from those along the boat route traversed, *via* Hill, Steel, and Hayes Rivers.

Once the sea route through Hudson Strait has been proved feasible, railways will carry to the coast of Hudson Sea, not only the grain, cattle and other products of our prairie provinces, but also of some of the north-western states, such as Dakota and Minnesota. Some kinds of farm produce, which will not bear the cost of transportation to Europe by the longer routes, may be sent by the shorter and cheaper one through Hudson Strait. Mr. Isaac Cowie suggests that by establishing this British route from the vast interior of North America, Canada will be virtually giving a preferential trade to Great Britain as compared with other countries.

RESEARCHES IN THE GREENLAND SEA.[1]

In the beginning of June 1905 the Duke of Orleans left Tromsö on board the *Belgica* for an oceanographical cruise in the Greenland Sea. The ship was under the command of her former captain in Antarctic seas, A. de Gerlache de Gomery; her first officer was Lieut. R. S. Bergendahl, who had served in a similar capacity in the *Fridtjof* in 1903-4 when that vessel sailed for the Antarctic in search of the Swedish Antarctic Expedition. In addition to the Duke of Orleans, there were three scientists on board, MM. Récamier, Mérite, and Koefoed. After visiting Spitsbergen, where some work was done off the north coast as far east as Treurenberg Bay, the *Belgica* left for East Greenland, following the edge of the pack from about lat. 80° N. and long. 2° E. Heavy pack compelled her to go southward to about 75° 30′ N. before she could turn northward along the land-water off the coast. The pack in 1905 was further to the east than usual, which caused more favourable conditions for navigation behind it along the coast. A latitude of 78° 16′ N. was reached by the Duke of Orleans before the ice compelled him to turn. Previous to this visit the coast was practically unexplored northward from 77° N. A running survey from the ship resulted in the location of several new points of land. North of the new France Island ice prevented a close approach to the shore, but some prominent points were fixed, though considerable doubt remained as to the nature of these points, whether inland peaks, headlands, or islands. The map of the Duke of Orleans was consequently little more than a sketch of this coast-line. Fortunately, however, it has since been completed by the Danish expedition of gallant Mylius Erichsen, and carried far to the north.

The *Belgica* then cruised southward through loose pack as far as about 71° N., where she concluded her oceanographical work and made for Reikjavik. Ostend was ultimately reached on September 12. Though only about ten weeks were spent in the Greenland Sea a very considerable amount of work was accomplished. But while we notice frequent references to the work of previous Norwegian investigators, notably Dr. Nansen, we are surprised to find no reference to the Prince of Monaco's work in these waters: this is a serious omission. Incidentally, however, we may point to a volume like this as evidence of the value of these short summer cruises in Arctic seas if undertaken by earnest scientists.

Commander A. de Gerlache contributes a general account of the voyage and a most complete log, which includes records of birds, seals, and whales observed. Eighty soundings were taken, and oceanographical work was done at fifty stations. It had been the ambition of the Duke of Orleans to penetrate further north with a view to investigating Nansen's theory that a submarine ridge connects north-west Spitsbergen

[1] *Croisière Océanographique accomplie à bord de la "Belgica" dans la Mer du Groenland, 1905. Resultats Scientifiques.* Bruxelles: Bulens, 1907. Pp. 568. Maps, charts, diagrams, and illustrations. Price 100 francs.

and Greenland, cutting off the deep Polar basin from the northward-running trough of the Norwegian basin. This plan was frustrated by adverse ice conditions, but these same conditions were to the advantage of the *Belgica* along the Greenland coast, because she was able to penetrate further than usual in slack ice landward of the heavy pack. The evidence of the Duke's soundings, however, is decidedly in favour of such a ridge.

MM. B. Helland-Hansen and E. Koefoed deal with the hydrography of the voyage in a comprehensive monograph illustrated with numerous charts and diagrams. A noticeable feature is a bathymetrical chart of the Greenland Sea drawn on the scale and projection of the Prince of Monaco's *Carte bathymétrique générale des Océans*, with which it is in every way uniform.

Deep-sea deposits are discussed by M. O. B. Böggild, who has also a note on a few rock specimens collected on the coast of Greenland, but these throw no new light on the geology of that country. Dr. C. H. Ostenfeld and others write on the botanical collections from the land. The collection makes no claim to be a complete one, but the absence of such conspicuous forms as *Saxifraga hirculus*, *Ranunculus glacialis*, and *Pedicularis humile* is commented on by Dr. Ostenfeld, who suggests that these eastern species, which probably came from Spitsbergen, reached Greenland by a route to the south of Cape Bismarck and have not spread northward. However, this suggestion must be accepted with caution. In Spitsbergen, where these species are common, one may land in many places without finding them, even if the habitat is apparently suitable; and it is more than probable that the same peculiarity of distribution obtains in East Greenland.

The discussion of the meteorological observations is by Dr. Dan la Cour. Observations were taken on board every two hours from Tromsö to Reikjavik. They have been co-ordinated with contemporary observations at Scandinavian, Icelandic, and Greenlandic stations, as well as on other ships. The results from July 1st to August 22nd are given in a series of synoptical charts, two for each day, of which the one illustrates the observations at 8 A.M., and the other those at 8 P.M. No better method could have been adopted than these graphic charts. The author is quite right in this contention; but it seems a pity that the observations are not also given *in extenso* in tabular form. They are included in an appendix to the Duke of Orleans' book *A Travers la Banquise du Spitzberg au Cap Philippe*, and might well have been reprinted here; for the four-hourly observations given daily in the commander's log are not convenient for purposes of reference in meteorological discussions. A summary of the Duke's observations, it may be mentioned, was given by Mr. R. C. Mossman in his valuable paper on "The Greenland Sea: its Summer Climate and Ice Distribution" (*Scottish Geographical Magazine*, xxv. pp. 281-310). As Mr. Mossman says, they "thoroughly support the results obtained by other expeditions to the South Greenland area, the low summer temperature and fog frequency being marked features in this cruise."

The lengthy memoir on the plankton is by MM. D. Damas and

E. Koefoed. The conditions under which the plankton was collected differed little from station to station. The *Belgica* was seldom in shallow water; most of her work was done in the deep sea. The variation in temperature of the water examined ranged between minus 1·8° C. and plus 3·8° C. only, while the salinities were between 31 and 35·2 per cent. Samples were taken up to depths of 600 metres, and on three occasions to 1800 metres. The illumination was, of course, the same during day and night. It is not, therefore, a matter for surprise to find a great uniformity in the plankton. The collections were made principally in the hope of elucidating certain geographical problems, and most especially the study of currents in the Greenland Sea. The authors discuss this problem at some length, but on the whole reach negative results. They maintain that since a species may be found at different depths in different latitudes depending on the temperature of the water, its chemical composition, its transparency, the amount of material which it holds in suspension, and its horizontal and vertical movements, it is very difficult to isolate the action of a single factor such as a current. Under certain circumstances, however, plankton can be employed as an indication of marine currents. These are, firstly, the sudden and periodical appearance of a form, otherwise completely absent from an ocean basin; secondly, the presence of mero-planktonic forms in seas on whose coasts they do not breed: thirdly, the marked abundance of a form, however widely distributed, in a certain layer of water. This indicates especially good life conditions, or factors which favour rapid reproduction; but the conclusions from the first two sets of circumstances will be more reliable than these from the third.

M. C. Hartlaub reports on the Medusae. None were previously known from East Greenland, and of the eight obtained four are new.

The fishes are described by M. Einar Koefoed, one of the naturalists of the cruise. Deep trawling was not possible with the gear on board, and in consequence the collection was small. While copious notes are given regarding the morphology of several of the species, there is no mention of their range of distribution.

The memoir on the invertebrates is by M. J. Grieg, who was assisted in the determinations in different groups by various authors. Five hauls of the dredge were made at different points off the north and north-west coast of Spitsbergen, and four off East Greenland. The greatest depths in which hauls were made was 310 metres off Spitsbergen, and 300 and 275 metres off Greenland. In all other cases the depth was 100 metres or less. From Spitsbergen waters no new records or new species were obtained. On the other hand, from Greenland waters are several new records for East Greenland, and some species were taken that are also new for West Greenland. One nudibranch, *Coryphella frigida* (Grieg), from East Greenland, is new to science, and possibly also two indeterminable species of sponge from the same locality.

The volume is sumptuously produced and illustrated with plates, maps, and diagrams in profusion. Some of the ice views are singularly beautiful, and none more so than the frontispiece of the *Belgica* among the pack. It is to be hoped that the Duke of Orleans will continue

the work which he has begun and pursued now for three summers. Oceanography is not a poor man's science, and few who would fain follow it find themselves in a position to do so. Consequently we hail with delight this latest recruit to the ranks of oceanographers, and look forward to several further memoirs on the cruises and work of the *Invicta*.

THE GEOGRAPHY OF CENTRAL AND SOUTH AMERICA[1]

As is mentioned in the preface to this new edition of Dr. Keane's work, very considerable progress has been made in geographical research in South America during the last decade. Rivers have been resurveyed, mountains have been ascended for the first time, fresh regions have been thrown open to the enterprise of the settler and the merchant, while even a hitherto unknown tribe of dwarfs has been discovered in the Papalacta district. Moreover, the creation of Panama as a separate state and the settlement of various boundary disputes have been effected since this work was first published, and thus a new edition embodying the latest results, scientific as well as diplomatic, is to be welcomed.

The leading features of the book are already well known—its masterly treatment of ethnological problems, its historical retrospects, its interesting surveys of the physical regions of the Continent, and its picturesque descriptions, as in the account of the scenery of the Gran Chaco.

In the present edition the statistical matter has been very carefully revised. A comparison of the present population of some of the great towns with that of eight or nine years ago, when this work was first issued, is very striking; and in many cases it offers the most reliable indication of the great material development of the country. Santiago shows an increase in its population of 111,000 during the seven years 1898-1905, while Buenos Aires, credited in 1898 with a population of 753,000, contained over a million inhabitants eight years later. In 1906 the Argentine Republic had a population of over five and a half millions, an increase of 44 per cent. in seven years.

In some cases, however, the population seems to have diminished considerably. Pasto had an estimated population of 13,000 according to the former edition of this work; in the present it is stated to have only 6000 inhabitants. Cartagena has fallen from 23,000 to 14,000, while Maracaibo, which "commands the natural outlet of the vast region comprised between the Colombian plateau and the Sierra de Merida," and must always remain the chief forwarding station for the produce of the district, nevertheless shows a decrease in its population of 9000

[1] *Stanford's Compendium of Geography and Travel.* (New issue.) *Central and South America*, vol. i., by A. H. Keane, LL.D., F.R.G.S. Edited by Sir Clements R. Markham, K.C.B., F.R.S. Second edition, revised. London: Edward Stanford, 1909. *Price* 15*s*.

In the same connection, the *South American Supplement* of the *Times*, published on December 28, 1909, should be noticed, as it is of great value to the geographer.

during the period intervening between the issue of the first and the second edition of this work. But the explanation of this recorded decrease may probably be found in the unreliability of the census statistics over the greater part of South America, and not in any actual diminution of the population.

Among the other evidences of the progress of the country may be noted the extension of the railway system, often in a manner, it is to be feared, which is a greater credit to the national ambition than to the financial wisdom of the promoters. Of these various schemes the great trans-continental line is by far the most important. On the Chilean side of the Andes the line has already reached almost to the summit of the Cordillera, while on the eastern side it has been completed as far as Punta de las Vacas, and hopes are entertained that during the present year these two points may be linked up and the Transandine Railway may become an accomplished fact (cf. this *Magazine*, p. 39).

Nevertheless, while acknowledging the efforts made to bring the present edition up to date, it is somewhat disappointing to find that the opportunity has not been taken to rewrite several parts of the work. Remembering that South America is certainly the most rapidly developing country in the world, and that we sent in 1908 goods of our own produce and manufacture to the value of £36,000,000, receiving, in return, imports from South America amounting to over £55,000,000, it cannot be said that the treatment accorded to the economic resources of this vast country is at all adequate, even after allowances have been made for the limits necessarily imposed by the size of the volume. Perhaps the defect of which we complain is most obvious in the discussion of the Argentine Republic. Of the ninety pages allotted to this subject only two are devoted to a statement of the material progress and the agricultural resources of the country. There is scarcely any reference to the immense capacity of the Argentine for the cultivation of wheat, in spite of the fact that no less than 34 per cent. of our supplies from abroad in 1908 were drawn from that quarter. No one could gather from the statement that "in the general movement of the foreign exchanges, the balance of trade is greatly in favour of the United Kingdom," that we were dependent upon the Argentine during the year just mentioned for 60 per cent. of our frozen mutton, 30 per cent. of our frozen beef, and 54 per cent. of our maize. Nor is there any reference to the rise of the dairying industry in the Republic, from which 3,000,000 lbs. of butter were exported in 1901, while four years later the exports exceeded twelve million pounds. Again, while it is true that the mineral wealth of the Argentine has not been exploited to the same extent as in some of the other countries of the Continent, yet a section might have been devoted to the treatment of the mineral resources, for the few casual references that have been made throughout the book do not give a fair account of the vast resources which the Argentine certainly possesses, and which only await efficient means of transport for their development.

One of the most unsatisfactory features of this volume, so excellent in many respects, is the entire absence of statistics, either of trade or of

population, for any consecutive number of years. Merely to give, as is done here, the figures for one, or at most two years, affords no indication of the development of the country, and indeed may often create very erroneous impressions. Instead of substituting the latest statistics for those printed in the previous edition, it would have been more satisfactory if the former had been placed alongside the latter. By this means a comparison of the two would have been possible, whereas to read that in 1906 the shipping of Bahia exceeded 1,288,000 tons signifies very little unless we are also aware of what was stated in the first edition, that it at that date amounted to 200,000 tons. The statistics of the export of coffee from Brazil in 1906 would have been much more significant of the prosperity of the country and the development of this industry if they had been accompanied by the figures printed in the first edition. It would then have been seen that within seven years the value of the export had increased by £7,000,000.

Unless, as appears probable, there has been a typographic error in the present edition, the fall in the annual output of silver from the mines of Northern Chile, from 360,000 lbs. to 34,000 lbs. in 1906, calls for some explanation which is not forthcoming, nor indeed is the decrease noticed, since the figures for the previous period do not appear in the present edition. Again, the effect either of bounty-fed sugar or of the development of the manufacture of beet sugar in the Old World upon the industry in Pernambuco cannot be appreciated simply from the figures for a single year.

The index to the volume might be considerably improved, for no reference whatever is made to any of the products of the country; even in its references to the topography it is not quite complete, and one looks in vain for any mention of Recife (although Pernambuco is certainly mentioned), Cartagena or Pasto, while the reader who expects to find the town of Maracaibo referred to on page 81 will be disappointed, for evidently this entry should stand against Lake Maracaibo.

This volume contains a vast amount of information, and could easily be rendered much more useful to the geographer if an attempt were made to correlate the various factors here dealt with, and if a much more adequate treatment were accorded to the natural and economic resources of the Continent. The illustrations add to the interest of the volume, and the maps have been brought up to date in accordance with the most recent decisions upon frontier disputes.

The ethnological map is very instructive, and in another edition the insertion of a map showing the distribution of population over the Continent, and also several maps to illustrate the climatic phenomena, would greatly enhance the value of the work.

A slight slip in the third line of page 404 can be rectified in a later edition.

THE TEMPERATURE SEICHE.

By E. M. Wedderburn, W.S.

(With Diagram.)

In this *Magazine* for November 1909 (vol. xxv. p. 591) there appeared a short article on Temperature Oscillations in Lakes and in the Ocean, in the course of which the nature of the Temperature Seiche in fresh-water lakes was briefly described. Unfortunately observations do not exist for a great number of lakes which are capable of demonstrating the presence or absence of the temperature seiche. It is the author's belief that a temperature seiche will be found in every lake in which there is a temperature discontinuity—that is, in every lake in which at a certain depth there is a rapid fall in temperature. In all fresh-water lakes with a depth of 150 feet and over, and sometimes in shallower lakes, there is in autumn, when the lake is cooling, a layer of water at the surface throughout which the temperature of the water varies little, but, at a depth which varies with the season and the size of the lake, there is a sudden fall in temperature, until a depth is reached at which there is again comparative uniformity of temperature. It is the layer of water in which there is the rapid fall of temperature which is called the discontinuity layer, and the sharpness of the discontinuity determines the distinctness of the temperature seiche.

The lakes in which at present clear evidence of the temperature seiche has been obtained are Lochs Ness and Garry (Ness basin) in Scotland and the Wolfgangsee in Austria, where most interesting observations were made by Dr. F. M. Exner.[1] In other cases there are observations which are not sufficiently continuous to show the periodicity of a temperature seiche, but which are nevertheless easily explained on the supposition that one exists. Of this nature are the observations made in July 1909 in Mondsee[2] in the Salzkammergutz (Austria) by Professor Halbfass.

Professor Halbfass has for many years devoted himself with great thoroughness to the study of lake temperatures, but he has not been able to bring himself to give more than a grudging assent to the existence of the temperature seiche. In a generous appreciation of the work done by the Scottish Lake Survey[3] he attributed the existence of the temperature seiche in Loch Ness to the regular character of the basin of Loch Ness and to the fact that the wind usually sweeps along its length. Further than this he could not go, at least until confirmation of the theory had been obtained in some lake of quite different configuration. This confirmation was obtained in Exner's observations in the Wolfgangsee. It is divided into two basins of unequal size and depth by a narrow con-

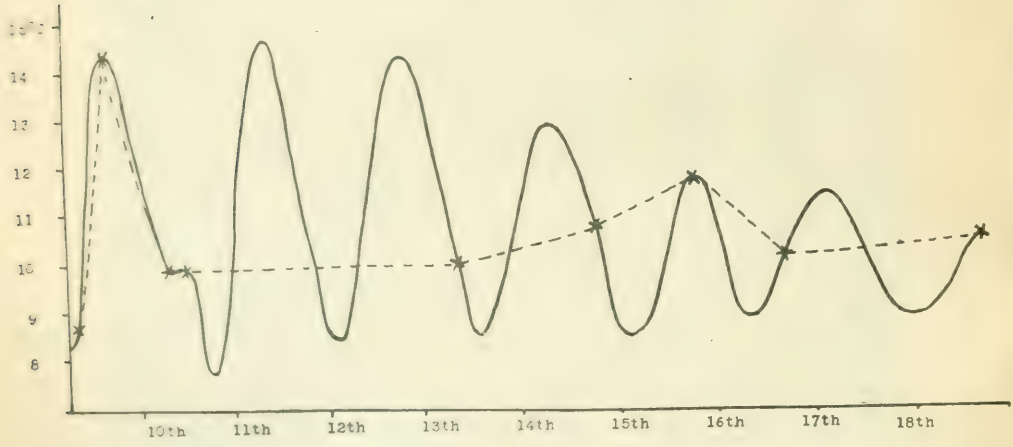
[1] "Über die eigentümliche Temperaturschwankungen von eintägiger Periode im Wolfgangsee," *Sitzber. akad. Wiss. Wien.*, cxvii. (2a), 9, 1908.

[2] "Zur Frage der Temperaturseiches," *Pet. Geogr. Mit.*, 1909. Heft xii.

[3] "Die Ergebnisse der Seenforschung in Schottland," *Globus*, Bd. xcv., p. 349, 1909.

striction, so that the contour of the lake is very irregular. Nevertheless Exner's observations showed the existence of a temperature seiche the period of which was nearly the period which a rough calculation of the probable period gave. His observations were the more interesting as they were primarily arranged to measure the depth to which direct heating by the sun's rays was appreciable. The value of the observations for determining this was completely spoilt because of the presence of the temperature seiche.

Professor Halbfass has now himself made observations in the Mondsee with the object of discovering a temperature seiche, and he concludes his description of the observations with the remark that at least in lakes similar to the Mondsee and in lakes which are not very narrow and



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straight, temperature seiches do not occur when the weather is of a variable character such as it was during his observations.

The Mondsee is a lake about 11 kilometres long, and with a fairly uniform basin, a considerable portion of which is over 60 metres deep. It is somewhat crescent-shaped, but just such a lake as ought to be favourable to the development of temperature seiches, and if Professor Halbfass's observations did disprove the existence of one, as he thinks they do, they would deal a severe blow to the theory.

Halbfass's observations extended over ten days, but during that period only nine series of observations were made. The observations upon which he bases the above conclusion are so few that they can be used both as evidence of the existence of a temperature seiche and as evidence of its absence. The figure shows that this is so. It is a hypothetical diagram of the variation of temperature at a depth of 12 metres in the Mondsee from 9th to 18th July 1909. The vertical scale measures temperature in degrees centigrade, and the horizontal scale measures time. Halbfass's actual observations are shown by the crosses which

are connected by dotted lines. It will be seen how few and far apart the observations are. The second observation on 9th July was not made in quite the same position as the others, and possibly it should be omitted from the series.

The observations as they stand certainly do not afford much evidence of the temperature seiche. A rough calculation of the probable period of a temperature seiche, however, gives from 30 to 36 hours as quite a possible period, and it will be readily understood how insufficient are observations made at intervals of 24 hours, or longer, to show oscillations of a period from 30 to 36 hours. Observations at least every three hours would have been necessary.

The continuous line on the diagram which passes through all the observation crosses shows how a very large seiche with a period of 36 hours may have been in existence and yet not have been detected by Halbfass. It is not suggested that there actually was a seiche of the magnitude shown. That is unlikely, but it is probable that if Halbfass had observed at more frequent intervals he would have discovered a temperature seiche.

The observations were not made at one end of the loch, but at a distance of about three kilometres from the end, and therefore not very far from one of the nodes of the lake. This fact also would make the seiche difficult of detection. Any observations which are intended to show the presence or absence of either an ordinary or a temperature seiche should be made at one end of the lake.

It is in changeable weather such as Professor Halbfass experienced during his observations that one expects to find a temperature seiche. It is started by the action of winds in accumulating the warm surface water at the lee end of the lake. This means that the discontinuity layer is inclined from the horizontal, and whenever the pressure of the wind slackens or varies, the bottom water in the lake tends to swing backwards and forwards until the discontinuity layer comes to rest in a horizontal position. If there were no winds blowing across the surfaces of lakes their heating and cooling would simply be a matter of radiation, conduction, and convection. But winds produce currents which at certain seasons of the year produce accumulations of warm water at the lee end, and these in turn produce the temperature seiche.

There is no reason why very narrow lakes should have a monopoly of the temperature seiche. It is not disputed that wind blowing along the surface of any lake accumulates warm water towards the lee end, and when this accumulation takes place, and the accumulating force is removed, the density distribution in the lake is unstable. It is known that in narrow lakes a temperature or density seiche is then set up. In all lakes in which there is a temperature discontinuity the same gravitational forces are present irrespective of their shape or contour, and that stability should be reached by the temperature seiche in one class of lakes and by some other means in others is at least unlikely. No doubt in lakes which have a uniform trough-like basin the seiche will be more regular than in broad irregular basins, and in these the temperature oscillation may be so complicated that its periodicity will

be masked, and there may appear to be nothing but irregular variation in temperature.

The temperature seiche is an oscillation of the water in a lake below the discontinuity layer, and any changes which occur in the surface layers do not affect its character. The effect of winds except in very stormy weather is practically confined to the water above the discontinuity layer, and the currents produced by winds are found in that water, so that Professor Halbfass's conclusion that the temperature seiche does not exist in changeable weather is the more unlikely.

THE HISTORY AND ETHNOGRAPHY OF SOUTH AFRICA.[1]

Dr. Theal has done well in bringing out a third edition of his history of South Africa before the conquest of Cape Colony by Great Britain in 1795, for there is no one so competent to write upon this subject. This edition is enriched by seven ethnographical chapters on the Bushmen, the Hottentots and the Bantu, who have successively occupied the land since it was first inhabited by an unknown race of man. In these chapters many interesting and curious facts are noted. The Hottentots, though now reduced to a miserable remnant, were originally a pastoral people possessing large herds of oxen, which were used for riding and for carrying burdens but were not killed except on festive occasions. The bulls were taught to assist in guarding the herds from robbers and beasts of prey, to charge in battle, and to obey orders. When not fighting the Bushmen, who harried their cattle, the Hottentots fought among themselves, one tribe against another, so that anything but peace prevailed in the land. The Bantu are an unusually hardy people, and support privations and tortures that would kill a European. Horned cattle form their chief wealth, and these were trained with great care to lie down at order, to run in a circle or to dance in rows, and ox-racing was a favourite amusement at festivals. The care of the cattle and the milking of the cows was, as might be expected, the duty of the men. It was the business of the women to make the pottery required for domestic use, and the shape given to the vessels was often so true that one might think they had been turned on the wheel, and the clay was so well prepared that the pots resisted the greatest heat. Slavery did not exist among any of the tribes living on the coast, although it did among those who inhabited the interior of the country.

In the tenth century something is to be learnt of South-East Africa from Arab authors, who knew that the Bantu lived as far south as Sofola, where gold and ivory were obtained in abundance, though at the beginning of the sixteenth century the Portuguese could only get gold

[1] *History and Ethnography of Africa south of the Zambesi before* 1795. By George M'Call Theal, Litt.D., LL.D. Vols. i. and ii., with maps and plates, pp. 1024. London: Swan Sonnenschein and Co., 1907 and 1909.

there in small quantities. From the Arab traders the Portuguese first heard of extensive ruins inland, but none of the latter seem to have visited them, for the Great Zimbabwe is described as square with an inscription over the door.

It took the Portuguese many years of strenuous effort and much dogged perseverance before they succeeded in doubling the Cape and finding a new route to India. Cape Blanco was first reached in 1441, Cape Verde in 1445, Liberia in 1461, the Equator was passed in 1471, and the Congo was first seen in 1484. In 1486 Diaz left the Tagus with two small ships of 50 tons, doubled the Cape without stopping, and went as far as Algoa Bay. In 1497, Vasco da Gama touched at St. Helena Bay, gave a name to Natal, and touched at the Limpopo River, Mombasa and Melinde on his way to Calicut. On his return he doubled the Cape in March 1499, and reached Lisbon in August after a voyage of over two years. Considering the huge amount of men and money lost by the Portuguese in the sixteenth century in trying to develop trade and to find gold mines in South-East Africa, it cannot be said that they derived any advantage commensurate with their outlay. They never attempted to colonise, the climate forbade that, but they built forts at various points and did all they could to trade with the natives, for which privilege they had to pay a considerable tax to the local chiefs. The rich mines of gold, which they firmly believed to exist, were never found, in spite of costly expeditions in search of them, and all they ever obtained was a little alluvial gold brought to the coast by the natives. Their chief rivals in trade were Mahomedans, Arabs and Persians, whom they did their best to exterminate without mercy. Missionary enterprise did not begin till about 1560, and though a number of Bantus were baptized by zealous friars, their teaching had little or no effect, their labours were thrown away and left no trace. About the end of the century the Portuguese discontinued their fruitless efforts to trade with South-East Africa, and disappeared from the scene.

The Dutch now came upon the stage, for after 1616 they called regularly at Table Bay, though it was not occupied till 1552, when the Dutch East India Company founded a settlement by building a fort to contain from 70 to 80 men. Its reason for doing so was to have a half-way station on the voyage to India and Batavia where their ships could take in fresh provisions and where the sick could be left to recruit. For in those days the ravages caused by scurvy were terrible, and a ship would put in with a third of the crew sick, and after having lost a large number by death.

When the Dutch first arrived they found that Table Bay was visited at certain times in the year by two large Hottentot clans with a fighting strength of from 900 to 1000 warriors, and in course of time they learnt that the Hottentots far and near numbered from 45,000 to 50,000 souls. The orders of the Company were very strict that the natives were to be well treated and never molested in any way. The large quantities of sheep and cattle required for provisioning calling ships and for the use of the garrison could only be obtained from the natives, and, to prevent friction, only authorised agents of the Company were allowed to trade

with the Hottentots. At this time the hippopotamus and rhinoceros frequented the rivers in the vicinity, while lions and leopards were a danger to the newcomers.

In order to combat the evil of scurvy one of the first duties of the governor was to encourage gardening to supply vegetables for the fleets. So five years after the first landing, plots of ground were given rent free to any one that would cultivate them, and those who undertook to do so were called burghers, and were no longer considered servants of the Company. Though freemen they lived under restrictions: they could only sell certain things on certain days and at fixed prices. At this date the European population amounted only to 134 persons, including Company's servants and burghers, and all lived on excellent terms with the Hottentots. These were educated free, and when baptized acquired all the rights of a European, so that it was not considered derogatory to marry a woman of colour. In fact, owing to the paucity of Dutch women, mixed marriages were not uncommon, for the Company had always great difficulty in inducing orphan girls in Holland to try their luck in South Africa. The population therefore did not increase very rapidly. According to a census in 1679 there were in the settlement 87 burghers with 55 wives and 117 children, 30 European men servants, 133 male slaves, 38 female slaves with 20 children. And ten years later only about a third of the men were married, and many children of mixed blood had been born.

Before this time efforts had been made to explore the country, the aim being the mythical country of Monomotapa which appeared on their maps. For a good many years the explorers never got much beyond the Elephant River. But in 1685 an expedition headed by the governor himself reached Copper Mount in Namaqua Land, about 300 miles in a bee-line north of Table Bay. Though it suffered terribly from privations, it returned safe after an absence of five months, during which time the route was plotted by a surveyor and also a good part of the coast, for the party did not return altogether by the same route. Yachts were sent to explore both the west and the east coast, and Natal was bought from the natives for about £50 worth of copper goods.

In 1688 the Company sent out several Huguenot and Dutch families as new colonists. The former wished to live together, but the governor, who disliked foreigners, took care that they should be separated and intermingled with Dutch burghers. This plan was successful, for in a couple of generations the two nationalities were completely blended, and the descendants of Frenchmen became Dutchmen except in name. The lack of wives was not the only cause that impeded the growth of the colony. In 1713 it was visited by smallpox, which first attacked the Hottentot and slave population, carrying off nearly 200 of the 570 slaves in six months. Then the Europeans were attacked and lost a quarter of their numbers. The mortality among the Hottentots was very much greater, for nearly all who were seized with the plague died, and whole kraals disappeared without leaving a single survivor.

In 1721 the Dutch took possession of Delagoa Bay, which had been abandoned by the Portuguese, but in the following year the fort was

plundered by three English ships manned by buccaneers, who enticed away eighteen Dutch soldiers and then sailed away. A few years later it was abandoned; it was too unhealthy, and little trade was to be done there.

Towards the end of vol. ii. an episode is mentioned which is not without interest. In 1736, some elephant hunters who returned to the Cape stated they had met three Englishmen who had been wrecked and were living with the Kaffirs and had a numerous offspring. An investigation carried on at a later date proved that they and three young Englishwomen and several Indians had been wrecked between 1720-30 near the mouth of the Lwambasu River, that all had intermarried with the Bantu, and that their descendants are numerous at the present day.

THE REPORT OF THE ROYAL COMMISSION ON CANALS AND WATERWAYS.

(With Sketch-Map.)

THE final Report of this Commission, which has been sitting for nearly four years, was issued at the end of December last as a Blue-book (Cd. 4979), and contains some recommendations which specially concern Scotland.

As to general points, the most urgent part of the recommendations of the Commission is the establishment of a Central Waterways Board for Great Britain, consisting of three or five paid Commissioners to whom would be transferred certain main waterways, whose acquisition by the State is recommended. The majority of the Commissioners also recommend that the State should by free grant, loan or guarantee give financial aid to the unification and improvement of the waterways. Among the waterways to be transferred to the Board are the Caledonian and Crinan canals, now vested in the Caledonian Canal Commissioners.

A considerable amount of space is devoted in the Report to the proposed Forth and Clyde Ship Canal (*cf.* this *Magazine*, xxv. p. 414).

In the course of their long review of the project, the Commissioners take up and examine in detail the various alternative schemes which have been proposed. The conclusions regarding the strategical aspects of such a canal approved by the Committee of Imperial Defence were transmitted to them by the secretary of that Committee, and with reference to these the Commissioners make the following observations:—

"These conclusions, the result of an inquiry held by a sub-committee of the Committee of Imperial Defence, approved by the Committee, and communicated to us by the direction of the Prime Minister, show—

"1. That a ship canal constructed of the depth finally proposed by Sir John Jackson and Messrs. Stevenson, but of a considerably greater width at the bottom (148 feet instead of 100), and with wider locks, 'would unquestionably possess some strategical value.'

"2. That this value is not so great as to induce His Majesty's Govern-

ment to propose either the expenditure of a considerable sum of public money, or a State guarantee of interest on the total estimated cost of construction.

"3. But that some Government aid would be obtainable towards a commercial canal, provided that it were constructed of the given dimensions so as to suit Admiralty requirements, and that

"4. It followed the route through Loch Lomond and Loch Long.

"Under these circumstances, the only recommendation which the Commission are able to make is that the Scottish and shipping interests, which would be commercially benefited by such a ship canal, should consider with the promoters of the Loch Lomond scheme whether funds can be raised for carrying the project into effect, and that if there should prove to be any prospect of sufficient capital being forthcoming, with such aid as His Majesty's Government may be prepared to offer, the probable amount of such Government aid should be ascertained, with a view to carrying the scheme into execution."

In regard to the Caledonian Canal also, the Commissioners are unfavourable to the expenditure of public money on the proposed enlargement to permit of the passage of large sea-going steamers. At the same time they report favourably on the proposal to cut down the summit between Loch Oich and Loch Lochy, so that Loch Oich would not be at a higher level than Loch Lochy.

With regard to the Crinan Canal, however, the Commissioners are in favour of extensive improvements. The accompanying sketch-map illustrates the various alternative schemes proposed for the improvement of sea-traffic in the region of the canal. We quote below the most important parts of the report relating to this canal.

In regard to the present condition of the canal, the following statements are made:—

"The Crinan Canal extends from sea to sea, from Ardrishaig on Loch Fyne across the neck of the peninsula to Crinan, and provides a sheltered passage from the Clyde to the West Highlands, some eighty-five miles shorter than the exposed voyage round the Mull of Kintyre. It is nine miles long, and has fifteen locks each 96 feet long and 24 feet wide, except the lock at Crinan, which is 108 feet long and 26 feet wide. The canal can be navigated by a vessel with a draught of 9 feet 6 inches. This canal is not only too narrow, shallow, and tortuous for use by the larger vessels of the present day, but can only be used by small craft or by vessels specially built to traverse it and the Forth and Clyde Canal. It was stated that the locks are worn out, that there has been no material improvement effected during the last hundred years, and that, by reason of rocks, sharp bends, and narrowness of channel, and sometimes want of water, the passage is difficult and dangerous. The captain of a steamship engaged in the Western Highland trade alleged that 'the present state of the western portion of the canal is a disgrace and crying evil,' and that the present canal 'is a complete barrier to the further development of passenger and tourist traffic, and effectually closes the door to healthy competition.' The canal was said by another witness to be 'quite obsolete' and 'hardly fit to be called a canal at all.'

MAP ILLUSTRATING CANAL SCHEMES

Ben Doran
Ben Cruachan
Ben Lui
Ben Ime
Ben Vane
Ben Lomond
Ben Lochain
Ben Reithel
Ben Mhanarch
Ben Muir
Ben Chonzie
Ben Ledi
Ben Venue
Ben Vorlich
Ben Chonzie
Ben Shalgurrain
Ben Buie
Ben Vane
Ben Lochain
Ben Reithel
Ben Mhanarch
Ben Muir

There are also considerable difficulties in the approach to the canal at Ardrishaig. It is impracticable except at high tides."

The Commissioners go on to say :—

"A strong case has been made out for an improved communication across the Mull of Kintyre, with only two locks at the two entrances, for much larger vessels than the small craft that at present navigate the Crinan Canal, capable, indeed, of taking the largest ships that ply between the Western Islands and Glasgow, with a reasonable margin for probable future developments in their dimensions. It is quite clear to experienced witnesses, that a canal capable of taking the ordinary steamboats of commerce would be largely used by them, so as to save time and coal and to avoid 'a good deal of knocking about in bad weather' outside the Mull of Kintyre. The present canal, owing to its small dimensions and other defects, which were very apparent to the Commissioners when they visited the canal and held an informal sitting at Oban in July 1907, is stated to keep down competition for the trade of the Western Highlands and Islands, to encourage high rates of transport to districts, many of which are very poor, and to discourage their export and import trade, and the development of local industries. It was represented to us both at this meeting and by witnesses summoned to give evidence in London, that an improved canal would lead to lower rates, and a great increase not only of this traffic, but of the trade in fish caught off the islands of Jura, Mull, etc., and conveyed to Glasgow, Fairlie, and other ports of the Clyde estuary. The revenue from tolls would be greatly augmented, it was said, by the increased tourist traffic, and by the use of an improved canal by the yachts which visit the west coast of Scotland in considerable numbers in the summer and autumn, and by trading vessels of considerable tonnage plying between the Clyde ports and the west and north of Scotland and the Baltic. This increase of traffic would make it possible to keep the dues for the use of the canal moderately low. Hopes were also held out of a further development on the Highland coasts of works run by water-power, such as have been established on Loch Leven, near Ballachulish.

"Between the rival projects, viz. the improvement of the Crinan Canal and the construction of a canal at Tarbert, which have been laid before us with great ability and clearness, and in much detail, by the respective engineers, the Commission would not attempt to decide, as that would be better left to the opinion of those in the west of Scotland who would be most interested in the new route. Some of the pros and cons of these alternatives may, however, be briefly stated. For details of the engineering, the other evidence should be studied.

"One important advantage in favour of the Crinan Canal would be that it would be more direct to nearly all places, with the exception of the island of Islay, and especially that the route to Oban would be about twenty-two miles shorter than the Tarbert route, owing to the south-westerly direction in which West Loch Tarbert points.

"The Tarbert Canal apparently has the advantage of costing less than half, possibly not much more than a third, in capital outlay as compared with the Crinan route. Also, there need be no interruption

to traffic on the Crinan Canal during the construction of the Tarbert Canal. Moreover, there would be but three miles of narrow navigation at slow speed, compared with about eight miles on the improved Crinan route. On the other hand, doubts were expressed before the Commission as to the facilities of navigation in West Loch Tarbert and the Sound of Jura, as compared with those at the western approach to the Crinan Canal. The entrance to West Loch Tarbert is not as good as might be desired, and the Sound of Jura in rough weather is not so satisfactory as the more sheltered waters near Crinan, where the emerging ships would not be exposed to anything worse than rapid tides. On emerging from West Loch Tarbert during a 'sou'-wester' the vessels which might prefer the Canal to a voyage round the Mull of Kintyre would still encounter the stormy seas which, passing to the east and west of Gigha, often continue to be very rough for ten or twelve sea-miles north of that island. And the tourists bound for Oban would be exposed to these troubled waters, which are avoided by the Crinan route. The tourist traffic, the fishing-boats, and some of the goods traffic might continue to use the present Crinan Canal, if means were found for its continued upkeep, in preference to the Tarbert route, thus diminishing the tolls for the latter.

"As regards the stoppage of the Crinan Canal for traffic during the three or four years needed for the construction of the improved canal, it must be borne in mind, first, that during that time tourists could be taken across the isthmus by road, as their luggage is now conveyed; and, secondly, that a plan for an alternative route to Crinan was laid before the Commission, which would involve a somewhat longer distance and two curves. The adoption of this route would obviate the stoppage of the Crinan Canal during reconstruction, but it was not strongly recommended to the Commission, nor does this alternative route impress us favourably, seeing that it would not, when completed, be as advantageous to commercial and tourist traffic, because, first, of its greater length (about one and a half mile), and, secondly, of these curves. As regards the public importance of either route, by Crinan or by Tarbert, the case presented was not so strong as to convince the Commission that such a considerable increase of traffic would be obtained as to insure a direct return on the capital outlay. It cannot be foretold with certainty to what extent the trade which is now carried round the Mull of Kintyre would by preference be taken by the shorter and less stormy route. But from the point of view of the poor populations of the Western Highlands and islands, and especially of the congested districts enumerated by Mr. MacGregor in his evidence, it is worthy of the consideration of the Government whether the contribution of a certain amount of public money, without the certainty of a direct return on the outlay, might not be justified. If it can be fairly expected that the supplies needed by the congested districts would reach them at a reduced cost, and that the trade of those districts would reach Glasgow more rapidly—if the fisheries also were likely to be benefited in the way suggested by some of the witnesses—and if the increase of tourists would develop local prosperity, a case would be made out which would,

in our opinion, justify a liberal grant of public money to meet such smaller contributions or guarantees as might be obtained locally and from traders."

In regard to English waterways, the Commissioners recommend that extensive improvements be carried out in the case of the important systems, by the Central Waterways Board, whose establishment is recommended by them. The main principle adopted is that the Midland mining, manufacturing and industrial centres should be linked to the main estuaries and seaports by efficient water communication. The centre of the network of existing waterways is, they point out, the industrial district round Birmingham. It is proposed to improve the waterways which lead outward from this centre to the Thames at Brentford, and (by means of the Regent's Canal) to that river below London Bridge, in one direction, and in the other directions to the Mersey, the Humber, and the Bristol Channel. A certain number of branch waterways which should feed the main routes with traffic are included. No construction of new waterways is recommended.

The work will involve the unification and gradual improvement of a number of existing waterways, fully described in the report.

The Report includes also a very instructive and exhaustive account of the waterways of the chief continental countries, based partly upon the observations of the Commissioners during their tours abroad, and partly upon the report by Mr. Lindley, an English engineer of great continental experience.

ERRATUM.—"Caledonia Rediviva." In Dr. Marcel Hardy's paper on this subject on p. 24, 11 lines from the top, the word *Foehabers* should be *Foyers*.

To the Editor of the "Scottish Geographical Magazine."

"CALEDONIA REDIVIVA."

(*Scot. Geog. Mag.*, Jan. 1910, p. 20.)

DUNIPACE, LARBERT, STIRLINGSHIRE, N.B.

SIR,—The principal reason why the initiative of the Drummonds of the Carse of Stirling was not continued or followed is, I fancy, quite historical. The Board of Trade stepped in and by special Act obtained the right to put a stop to the clearing off of "moss" by the course of the River Forth. I can easily remember huge masses of the upper moss-"crust" lying all along the bed of the river causing rippling surface-breaks on the water, whence I used to pick out many trout with fly. Since then all has become washed away as sediment, and has settled down as the "*slinks*," or mud-banks below tide-marks, and there has been no further cutting of peat or clearing off "moss" in the Carse of Stirling, or Vale of

Menteith. A proposal by a German company to utilise the "moss" of Kippen, I think, got "strangled" by the knowledge of the Board of Trade's veto, as well as by the difficulties attendant upon obtaining free levels.—Yours faithfully, J. A. HARVIE-BROWN.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

At a Meeting of Council held on the 18th December, the following ladies and gentlemen were elected Ordinary Members of the Society :—

Mrs. E. Miller.
T. D. Hunter.
Alexander Mackenzie.
John M. Kerr.
Douglas W. Swire.
Thomas Maclachlane.
Robert Davidson.
John Watson Stewart, M.A.
Major William Stewart.
Miss Logan.
John Thornton.
Vaness C. Baird.
John Dunn.
Henry G. Pattullo.
George S. MacLellan.
George A. Simpson, M.A.
Commander Irvin Hayward, R.N.R.
Frederick Dunsmure.
John Bonnar.
George R. Donald.
Nicol P. Brown.
Andrew Richardson.
Miss Clara A. Fairgrieve.
Miss Patricia E. MacQuibban.
James Hendrick, B.Sc., F.I.C.
Colonel R. S. Thoms, V.D.
John Fairlie.
Laurence B. Huss.
R. S. Alexander.
Malcolm Maclean.
John Taylor Tulloch, C.A.
Robert Nicol.
James L. Geddes.
Malcolm Livingstone.
John Cassels.
John Inglis.
John Robertson.
George Davidson.
G. W. S. Walker.
James A. Parker, B.Sc., M.Inst.C.E.
Alfred S. Fleming.
William Stewart.
James Nicoll.
James Moon, M.D.
James Tennant Gordon, F.S.A. (Scot.).
Sir Duncan E. Hay, Bart.
Mrs. E. Veitch.
John E. Macqueen.
Alexander Duffus.
George Duncan, M.A.
Frederick W. Ray, M.A., B.L.
Ernest Rennet, M.A., B.L.
Mrs. A. Clark.
Prof. F. M. Caird, F.R.C.S.

The undermentioned ladies and gentlemen were elected Teacher Associate Members of the Society :—

Miss C. Yule.
Miss F. Yule.
Miss Jessie Carrie.
Miss Emma K. Macdonald.
Robert Macnab.
Miss Elizabeth H. Raitt.
P. A. Conacher.
Miss E. M. Irvine.
William Baird.
Miss Mary W. Gilchrist.

At a Meeting of Council held on the 4th January, the following were elected Members of the Society :—

Alexander MacKelvie, C.A.
Adam Hunter.
Mrs. E. J. Lochhead.
P. S. Brown.
C. S. Howard.

Mr. M. R. Gillanders, M.A., was elected a Teacher Associate Member.

LECTURES IN FEBRUARY.

Sir Ernest H. Shackleton will address the Dundee Centre on the 1st inst. on his explorations in the Antarctic Regions.

Prof. John L. Myres will lecture before the Edinburgh and Glasgow Centres on the 3rd and 4th inst. The title of his address will be "The Geographical Study of Greek and Roman Culture."

Mrs. Gabrielle M. Vassal will address the Society in Dundee, Aberdeen, Edinburgh, and Glasgow on the 15th, 16th, 17th, and 22nd February respectively. The subject will be "Life in Annam."

GEOGRAPHICAL NOTES.

EUROPE.

The Banffshire Avon and the Don.—In Mr. Mackinder's *Britain and the British Seas*, p. 127, it is stated that the Banffshire Avon, "if we may judge from the map," has apparently captured the head-waters of the *Dee*. We have already pointed out here that *Dee* is apparently a misprint for *Don*, but with this correction the suggestion seems to have much presumptive evidence in its favour. A difficulty is, however, that at the curious bend which occurs on the Avon near Inchrory, that river lies some two hundred feet below the level of the Don. Mr. A. W. Gibb, of Aberdeen University (cf. *Trans. Edin. Geological Soc.*, ix.), has recently studied the question on the spot, and comes to the conclusion that anything like a recent act of piracy by the Avon is out of the question. On the other hand, as the valleys alike of the Avon and the Don are ancient, perhaps dating back to Old Red Sandstone times, he suggests that the capture was a very ancient one, and that the difference of level between the two has been produced subsequently by the greater erosive power of the Avon. The author himself is not entirely satisfied with this explanation, which presents some difficulties: and we think also that probably the whole explanation is not yet found. The question is certainly an interesting one. Mr. Gibb's paper is illustrated by a sketch-map and two interesting photographs.

Climate and Topography in Scotland.—The Rev. John S. Begg contributes to vol. xv. of the *Journal* of the Scottish Meteorological Society a short article upon the climate of West Linton, considered in relation to its geographical position. A comparison of the meteorological observations taken at West Linton with those taken at Leith and on Blackford Hill shows that at West Linton in calm clear weather the nights are very much colder than the elevation justifies. This is explained by the position of the village in a valley, and, as has been already shown by many other observers, in calm weather the cold air tends to accumulate in the bottom of such valleys, and thus produces a lowering of the temperature below the normal. Owing to diminished radiation in cloudy weather, on the other hand, the nights are not then abnormally cold at West Linton. Further, owing to the inland position, it is found that when the wind is from the north-easterly portion of the compass, there tends to be more sunshine and a higher temperature during the day at West Linton than either at Blackford Hill or at Leith. This is especially true in spring and summer when the sea is relatively cold. On the other hand, with south-westerly winds, West Linton tends to have a lower temperature and less sunshine than the two other stations.

The Messina Earthquake.—The August and September numbers of the *Bollettino della Società Geografica Italiana* contain a report on the condition of Messina after the earthquake of Dec. 28, 1908, and on the causes which served to produce the great devastation. Signor Baratta

was commissioned to make the investigation. The full result is to be published later on, but meantime he gives a short and most interesting account, illustrated by extremely valuable photographs and charts.

The conditions which made the catastrophe so great were the geological features on the one hand, and the state of the buildings on the other. The hills at the back of Messina are of crystalline rocks, at the foot of which lies an old alluvial deposit of Quaternary age. Towards the sea there is superimposed another deposit of modern origin, and it is largely on this last deposit that the town is built—obviously not a very stable foundation. With regard to the buildings, Baratta states that the foundations were bad, and the construction of the worst kind. The houses were much too high, and the roofs so built as actually to push the walls away from them. After the great earthquake of 1783, it was duly recognised that the buildings must be low, of one story if possible, and they were so constructed, but as the years went on and the population increased, stories were added one after another, even to five stories, while the retaining walls were not strengthened in proportion. The materials were faulty, the smooth round pebbles from the alluvium being used, and these offered no grip to the plaster. The mortar was inferior and without cohesion. The façade walls were not tied to the lateral walls but merely leant against them, and so with the partitions. Nothing was securely riveted to anything else. All the characteristics of lazy, happy-go-lucky jerry-building are in evidence. Moreover the cracks made by old earthquakes were simply plastered over, and the walls built upon as if they were sound. One house there was, that of Prof. Camareri, which remained intact amidst the surrounding devastation. It was scientifically built of good materials. A full description and photograph of it are given.

The report when complete will be of great interest to architects, and it is to be hoped that the lessons will not be forgotten.

Asia.

The New Flora of Krakatao.—An interesting article in the August number of the *American Naturalist* gives some account of the re-colonisation of the island of Krakatao after the great eruption of 1883. The result of this eruption was to bury the whole surface under a layer of ashes and pumice varying in depth from 90 feet upwards, and so to destroy all plants. Three years later Dr. Treub visited the island and found that a number of the higher plants had established themselves, the process being aided by blue-green algae, which prepared a suitable mould for higher plants. The plants in the interior proved different from those near the coast and ferns predominated. Successive visits by different persons since have shown that gradual changes are taking place in the flora, an especially interesting point being the growth of forest trees, which will soon cause the island to be as densely forested as before the catastrophe. Nitrogen-forming bacteria have played an important part in colonisation, in that they have rendered the soil fit for higher plants. The earliest immigrant plants, especially bacteria, blue-green algae

(Cyanophyceae), mosses and ferns were certainly brought by wind, as were probably the first flowering plants to arrive (composites and grasses). The later forms, and especially the shore-plants, seem to have been carried by ocean currents.

Dr. Longstaff's Himalayan Expedition.—Some fuller details in regard to this expedition appear in the January issue of the *Geographical Journal* (cf. vol. xxv. pp. 603 and 652).

One of the inducements which decided Dr. Longstaff to make for the Saltoro Pass was the knowledge that the main axis of the Karakoram had never been crossed by any traveller between Younghusband's Muztagh Pass and the Karakoram Pass itself, a distance of one hundred miles in a straight line and 150 miles as measured along the accepted crest-line. Although the name Saltoro Pass has been handed down to us by tradition, there is no record of any one, European or native, having crossed it, and its exact position was uncertain. When Dr. Neve, Lieutenant Slingsby, and Dr. Longstaff crossed this pass (the Saltoro, 18,200 ft.) on June 15 last, they saw before them a huge glacier bounded to the north and east by a lofty range of snowclad peaks. At first sight they assumed that this glacier flowed northwards as shown on the maps. But when, on the following day, they reached the main glacier, and were able to examine it, they found that it was flowing to the south. In September, following the independent suggestions of both Colonel Burrard and Sir Francis Younghusband, and with the assistance of Captain D. G. Oliver, British Joint Commissioner for Ladak, Dr. Longstaff was able to make his way up the Siachen glacier (Saichar on maps) and to establish its identity with the glacier the party had visited and surveyed in June. But the Siachen glacier, instead of being some twenty miles in length, as has always been supposed, turns out to be more than forty-four miles long, and it pierces the range that has hitherto been regarded as the main Karakoram axis.

This discovery has shown that the Siachen is the longest glacier in the Himalayan system, and probably the largest outside the Alaskan and Polar regions, its only competitor being the Inytchek glacier of Merzbacher, in the Tian Shan. When it is remembered that the Siachen glacier drains into the Nubra river, it becomes obvious that the basin of the Indus must extend much further northwards than has been thought. In short, the Indus-Yarkand water-parting here follows a chain of mountains not shown on any maps and lying some twenty miles north of the high range upon which it has been hitherto located.

Perhaps the most interesting discovery has been the existence of a group of very lofty peaks, crowning this new chain of the Karakoram, and culminating (about long. 77°, lat. 35° 30′) in Teram Kangri, 27,610 ft. in altitude. Thus, if Dr. Longstaff's measurements can be accepted, this new peak is only overtopped by Everest, K2, Kinchinjunga, and Makalu. He feels considerable hesitation in attaching such an immense height to a peak which has escaped the observations of the Survey of India; but this peak is not a satellite of K2, or of Gusherbrum; it is the culminating point of a totally distinct *massif*, which, so

far, has not been shown on any map. It should be remembered also that Colonel Burrard predicted of this region that it was the most likely of all unexplored areas of high Asia to contain high undiscovered peaks.

If, in view of these new facts, the structure of the eastern Karakoram is considered, it seems that we must place the main axis of elevation along a line drawn from K2 to Teram Kangri, and on to the Karakoram Pass. Whether the Karakoram is to be considered as consisting of two more or less parallel ranges, or whether it bifurcates in the neighbourhood of K2, cannot yet be stated with certainty.

Africa.

The Congo Frontier.—According to the *Times*, negotiations are to begin shortly at Brussels with regard to the Eastern Congo frontier. The following boundary will be proposed on behalf of England, with the view of substituting a natural frontier for an astronomical one:—The west shore of Lake Albert, the *Thalweg* of the Semliki River, which connects Lakes Albert and Albert Edward, and a line drawn from the mouth of the Semliki in Lake Albert Edward to the first parallel of South latitude, the position of this line to be determined afterwards in accordance with the lie of the land. England would thereby secure the territory lying between the Semliki, the first degree of South latitude, and the 30th meridian of East longitude, together with access to Lake Albert Edward and the whole district of Ruwenzori. The Congo, on the other hand, would obtain the strip of territory lying between the present frontier and Lake Albert and the Semliki, as far as the point where the 30th meridian cuts the latter, together with the whole west shore of Lake Albert, on which at present it only possesses the landing-place, Mahagi.

The question to be decided between Germany and Belgium has to do with the possession of the Rusizi River, which Germany claims as her frontier, on the ground that it is attributed to her in the map annexed to the Convention of November 8, 1884, which determines as the frontier the 30th meridian as far as 1 deg. 20 min. South latitude. Now that the 30th meridian is found to lie in this neighbourhood to the east instead of to the west of the Rusizi, Germany claims the river as the natural frontier, while Belgium stands out for the astronomical boundary-line.

The Orange River Colony.—We are informed by the Colonial Office that under the South Africa Act, 1909, the Orange River Colony will become a province of the Union under the name of Orange Free State, with the same limits as the Colony at the establishment of Union.

America.

Swiss Scientific Expedition to Bolivia.—According to the *Times* the Swiss Federal Government has decided to send a scientific expedition into the unexplored parts of Bolivia under the leadership of

Dr. Fuhrmann, Professor of Zoology at the University of Neuchâtel, and Dr. E. Mayor, an expert in medicine and botany, of the same University. The explorers will leave Switzerland for South America on July 1, 1910, and their object will be to study the fauna and flora of the country, as well as the fish in the rivers, and the climate. The expedition will last a year. It is stated that several English and American men of science have expressed desire to join the expedition at their own expense, and their offers have been accepted.

The Indians of California.—We have received recently a number of reports from the University of California, including especially studies of the Indians of the region. Two of these, *Types of Indian Culture in California*, by A. L. Kroeber, and *Life and Culture of the Hupa*, by Pliny Earle Goddard, contain some interesting ethnological facts. (The papers are dated respectively 1904 and 1903, but, as indicated, they have reached us recently.)

The first paper draws attention to the general characteristics of the Californian Indians. In many respects they were, when first studied, less specialised than the other American Indians. Their culture was scarcely above the Eskimo level, and that in spite of the favourable environment. They were not warlike at the time of their discovery, and, though hunters, their undifferentiated weapons and their very moderate skill made them largely dependent on vegetable food, especially on acorns. They were not agriculturists, and their arts were primitive, only basketry reaching any degree of development. There was no pottery nor woven textiles. Individual property rights were, however, well marked in spite of the primitive organisation, and rank depended on property, which consisted largely of non-essentials. Ceremonies played a large part in the daily life, and occupied a considerable part of the time of the men.

These general statements are illustrated by Mr. Goddard's detailed account of the life of the Hupa Indians, who now occupy a reservation on the Trinity River in Humboldt county, California. These Indians inhabit a country formerly rich in game, and with rivers abounding in salmon and other fish. Their houses are built of planks, formerly prepared by fire, the stone knife and elk-horn wedges. The men in the old days were hunters, but the staple food was acorn flour. The collection of the acorns was the work of the women, who also shelled and ground them, washed the flour to remove the bitter substance, and then cooked the residue into a kind of "mush." The cooking was accomplished in water-tight baskets, by means of flat stones heated in a fire and then dropped into the basket containing the meal and water. Other seeds and nuts, and also bulbs and berries were eaten. Interesting from the evolutionary point of view is the fact that before the coming of the white men the seeds of native grasses, Composites, and other plants were collected, and after careful picking reduced to flour and eaten. No further step beyond this was apparently taken, and with the introduction of European weeds by the incoming race the practice was abandoned. Another interesting point is that while basket-making and cooking were the work of the women, no less than the collection of

vegetable food, net making, as well as the manufacture of bows and arrows and the dressing of hides, was the work of the men. In other words, the arts related to the obtaining of vegetable food and to cooking were feminine arts, those related to hunting or fishing and war masculine arts. On the other hand, while the women dressed and cured fish, deer were cut up by the men with some formality, and according to prescribed rules. The only cultivated plant was tobacco, which was sown in wood ashes.

The paper also includes a very interesting account of the social life of the people.

Polar.

Dr. F. A. Cook's Arctic Expedition.—As already announced here, Dr. Cook's report of his Arctic journey was despatched to the University of Copenhagen at the end of November last. The report of the special committee appointed by the University was issued with remarkable promptitude, and is highly unfavourable. The Committee state that the documents submitted to them afford no proof that Dr. Cook reached the Pole. There has been a general tendency to accept this decision as having finally disposed of Dr. Cook's claim to have reached the North Pole.

Captain Scott's Antarctic Expedition.—It is announced that Captain Scott has received a letter from the Treasury informing him that Parliament will be asked to vote a sum of £20,000 towards the cost of his proposed expedition to the South Pole. Captain Scott states that this grant, together with the subscriptions already received, ensures the departure of the expedition in July next. Christchurch, New Zealand, is to be the base, and the ship, which will travel outwards *via* the Cape and Australia, is expected to leave New Zealand next December.

The following appointments have already been made in regard to the staff of the expedition:—Lieut. E. R. G. Evans, R.N., will be second in command; Dr. A. E. Wilson will be chief of the scientific staff, and will also act as zoologist and artist; Dr. J. Mackintosh Bell, director of the Geological Survey of New Zealand, will be one of the three geologists who are expected to accompany the expedition; Dr. R. Simpson, of the Indian Survey Department, will be one of the two physicists. Mr. C. H. Meares, who has travelled extensively in China, is proceeding to Eastern Siberia to arrange about the dogs and ponies required for the expedition, which are to be shipped *via* Japan to New Zealand.

General.

The Geography of Passes.—Those whose summer holiday—now alas a thing of the far past!—has led them to the mountains may be interested in an article with the above title which appears in *La Géographie*. The article is an analysis by M. Raoul Blanchard of a somewhat lengthy illustrated paper by Dr. Johann Solch, which refers chiefly to the passes of the Eastern Alps.

It is noted in the first instance that a pass in the morphological sense has a somewhat wider significance than as ordinarily used in human geography. In the latter case the word indicates a practicable pass, permitting of some interchange of commodities, in the wider sense it is merely a depression in the summit line of a massif. The author distinguishes two primary types. The first, which is almost the "col" of the English climber (though not of the French geographer, who uses the word in a wider sense), includes those passes which form only a slight depression in the crest line (German Passübergang). The second type, (German Passdurchgang) is practically the "pass" of usual English speech, *i.e.* a depression sufficiently well-marked to separate two mountain masses. The first occurs in three chief forms, as an arête or ridge, as a saddle, and as a plateau. The second type has two chief divisions, that of longitudinal and transverse passes.

From the point of view of origin passes fall into two divisions, those due to constructive agencies and those due to erosion, whether fluviatile or glacial. The former type is virtually absent in the Alps, and is chiefly found in volcanic districts, or regions of recent uplift. Passes due exclusively to river action are also rare in the Alps, owing to the frequency of glacial action. The most interesting and most frequent are those due either exclusively to glacial action, or to the modifying action of the ice on a pre-existing pass of fluviatile origin.

Taking first the col (Passübergang) type, the most frequent form is the "brèche," which in the Eastern Alps almost always occurs between two cirques. By the continued action of the ice this tends to pass into what is known as a "Joch" in the Alps ("through valley" of Professor Tarr)—that is a flattish depression, more or less saddle-shaped. Most of the passes of the Eastern Alps are, however, of the Passdurchgang type. Here the author distinguishes between those, like the Maloja, Brenner, St. Gothard, Grimsel, etc., which were formerly traversed by glaciers which crossed the water-parting to join those of another system, and those which were traversed merely by branches of a glacier. The second point is readily understood by reference to many of the existing glacier systems, where it often happens that from a great glacier flowing in a given direction smaller branches flow out at a direction making an angle with the main system. In some cases the erosion due to the lateral branch was so great that after the disappearance of the ice the water flowed by its valley, leaving the original valley in the state of a col. An example of a col due to such a lateral tongue of ice is the Monte Ceneri, which owes its origin to a branch of the Tessin glacier. The author concludes by drawing attention, as does also Professor Tarr in his article on glacial erosion in the Highlands (cf. this *Magazine*, xxiv. p. 575), to the great aid to communications rendered by the ice, which has produced or smoothed and modified all the important Alpine passes.

A Mediæval Cartographer.—Dr. Eugene Oberhummer, Professor of Geography at the University of Vienna and President of the Imperial Geographical Society, who was recently elected an Honorary Fellow of the R.S.G.S., has presented the Society with a very interesting work.

In conjunction with Dr. Franz von Wieser of Innsbruck, Dr. Oberhummer prepared, as a "Festschrift" for the fiftieth anniversary of the Vienna Geographical Society, an account of the cartographical works of Professor Dr. Wolfgang Lazius, Historiographer-Royal to the Holy Roman Emperor Ferdinand I. at Vienna in 1554. Lazius lived at the time of the great mediæval revival in geography. He was a contemporary of Ortelius and Mercator, and his picturesque maps were the most complete representations of the Provinces of Austria and of Hungary at that period. Dr. Oberhummer's handsome monograph comprises a sketch of the life of Wolfgang Lazius, a critical appreciation of his work as a geographer and cartographer, with facsimile reproductions of the "Typi chorographicae Austriae," and many more of his quaint maps and sketches. To commemorate the fiftieth anniversary of the Imperial Geographical Society of Vienna nothing could have been more appropriate.

Commercial Geography.

The Cape to Cairo Railway.—On January 1, 1910, another section of the railway on the Cape to Cairo route was opened for public traffic. The line from Khartum southwards, which follows the west bank of the Blue Nile, has already reached Wad Medani, 120 miles south of Khartum, and this section is now in use.

EDUCATIONAL.

We have spoken here several times lately of various types of geographical pictures, and it may therefore be useful to call special attention to those in Professor Emmanuel de Martonne's new *Traité de Géographie Physique*, a book which we shall review elsewhere. The book is very copiously illustrated, and the illustrations are not only valuable in themselves, but they afford also many hints as to how photographs and diagrams may be best utilised by the geographer. In addition to the illustrations actually presented, the author, in his bibliographical lists at the end of each chapter, specially signalises those papers and books which contain illustrations bearing upon the particular points discussed in the chapter. He gives also a list of maps which illustrate the special phenomena described.

It is a favourite saying with the modern type of museum curator that a museum exhibit should consist of a label, with a specimen attached. Similarly, a good geographical picture should consist of a legend with an illustration attached, and it is the excellence of the lettering which specially distinguishes M. de Martonne's plates. The plates have been selected with great care to illustrate special points, and the lettering brings out fully these points. For example, there is an admirable series illustrating glaciers. Such pictures are relatively easily obtained, either by purchase or by the aid of the amateur photographer, but the difficulty is that the owner is not always clear as to what exactly they show. It is here that Professor de Martonne's descriptions will be of great service.

We note, for instance, two views of the Argentière glacier—views which in themselves are not more striking than many other similar ones, to be obtained on picture-postcards or elsewhere. From these two, however, Professor de Martonne brings out clearly the contrast between the modelling of the surface according as it has or has not been exposed to the action of the ice. One picture shows the upper region of the glacier, with the tributary glaciers separated by sharp arêtes, whose form is due to aerial denudation, and shows also the origin of the moraines, whose beginnings mark approximately the limit of the névé. The lower picture shows the extremity of the glacier; here *roches moutonnées*, over-deepening, the formation of glacial terraces, and the other features of glacial topography are clearly seen owing to the retreat of the glacier. An even more striking plate shows the Dent d'Herens and the Matterhorn, with the Zmutt and Matterhorn glaciers. Here we have the contrast between a plateau glacier and the valley type shown, the distinction between the two being fully described in the text. Another fine series of plates is that illustrating the chief types of vegetation.

Apart from the special plates, there is also a series of figures in the text. Some of these are instructive "block-diagrams," of the type made familiar by Professor Davis; others are drawn from photographs. The latter, though not so attractive at first sight as photographs, seem to us important from the teacher's point of view. Some are so simple that they could be readily reproduced on the blackboard or as wall diagrams; others might be further simplified with the same object in view. Finally, apart from the text maps, often most useful and instructive, there are many diagrams. We note specially one illustrating the seasonal rainfall of the inter-tropical regions, which is of great beauty and simplicity. Altogether we think the teacher will find in the book many hints as to the best way of utilising pictures and diagrams in geographical teaching.

NEW BOOKS.

EUROPE.

Paris in 1814*; or a Tour in France after the First Fall of Napoleon.* From the Journal of William Roots, M.D., F.S.A. Edited by Sir Henry A. Ogle, Baronet. Newcastle-upon-Tyne: Andrew Reid and Company, Ltd., 1909.

This interesting little volume is a reproduction of the journal of a doctor of medicine in Kingston, during a three weeks' trip to Paris, with his wife and two children, in 1814. It is full of quaint remarks, and has a number of illustrations, equally quaint, but which lose much of their effect from the want of the colours in which the originals were executed.

The difficulties and expense which beset travellers a hundred years ago are vividly brought home to the reader. There does not appear to have been any extravagance in the style of travel adopted, and yet the expense of conveyance from London to Paris and back was over £60, more than half the total cost of the trip. The party posted in a chaise and four to Dover, spending a night at Canterbury. The voyage in a packet-boat to Calais took five hours. They missed the tide, and had to be

rowed three miles towards the shore, and to be carried on men's backs for a quarter of a mile.

The hotel accommodation abroad was such that on reaching Brighton on their return, "we turned into the first clean and comfortable beds we had been in since we left Canterbury." On leaving Rouen, they were glad to get out of the filthy beds, and, later, learned that a dreadful fever had been raging there; that in the very hotel they had slept in seven people had died within the previous three weeks. The return was *via* Dieppe and Brighton, and the *Nautilus* was so full that none of them had any place to lie down. The voyage took from twelve on Sunday night till eight on Tuesday morning. Most of the passengers were ill all the time, and the provisions went done. Even on reaching the coast, they had to sail and row for an hour in a rowing-boat, and to be carried thence ashore on the backs of fishermen.

Their route took them to Paris by Amiens and Chantilly, and they reached Paris only a few months after the first fall of Napoleon, and the restoration of Louis XVIII. All the way they found the people haunted by the memory of the Cossacks who had been billeted upon them, especially at Chantilly, where some 20,000 of them had been billeted.

On the heights of Montmartre they stopped to look at the newly-turned ground in hollows and ridges, which formed the humble graves of more than eight thousand "of our fellow-men all gone to their last home prematurely, and sent there through the vile and unjustifiable ambition of one little animal no more than a man himself." Dr. Roots hired a chariot and pair of horses and a coachman at a louis a day, and found this not only the cheapest, but by far the most agreeable as well as "respectable" way of getting about. It was always a "letter of recommendation," for "to stop at the doors in his own carriage it was a very handsome and gentlemanlike thing for the purpose," and guides in consequence always addressed him as "Mi Lor."

Everywhere were recent traces of Napoleon. They traced him and his Empress "from their very beds to their breakfast tables and their dining-rooms, their promenades, their drawing-rooms, and again to bed." "Their very beds were hardly cold from having been so recently occupied by them."

We have glimpses of the old King Louis XVIII. "waddling" along the corridors of the Tuileries to mass in the Chapel; of his niece, the Duchesse d'Angoulême, sitting there beside him, looking overwhelmed with grief and anxiety, with an air of despondency in her countenance "that bespoke an unhappy mind reminiscent of the horrors she had gone through"; of Prince Talleyrand walking up and down a balcony in his house opposite the travellers' hotel in the Rue Castellane, with a paper in his hand earnestly endeavouring to get by heart a speech (possibly his opening speech at the Congress of Vienna), and making use of the most vehement action; of the tombs of Voltaire and Rousseau at the Pantheon, where the author remarks: "Having looked at the grave of these two founders of all the revolutionary misery that the world was just relieved from, we took our leave without any emotion, for better had it been had they never been in existence; inasmuch as, by casting their infernal doubts on the score of religion, they paved the way for all the atheistical horrors that immediately followed."

A fortnight was spent in sight-seeing, and as English folk they found themselves everywhere treated with marked respect. Great admiration is expressed of the many art treasures recently brought to Paris by Napoleon, who "on entering his enemy's capital, not only rushed with a bandit's ferocity to the palace of its sovereign, but packed up every treasure and curiosity to send off to his depot of infamous rapine."

Here is Dr. Roots' description of the streets in Paris: "Paris has no foot-path or pavement for the foot-passengers; the streets are narrow, and a gutter runs down the centre of each: the consequence is, that if you avoid being run over, you are splashed and almost overwhelmed with mud, from the incessant passing and repassing of *fiacres* and *cabriolets*, to say nothing of being crushed between the wheels of the carts and the houses, as the naves of the cart-wheels project nearly a foot beyond the tyre; and though stone posts are placed at convenient distances to protect the buildings, yet in the intervals half a dozen people may be crushed."

The French roads are praised as being on a "much more expansive and lasting plan" than the English; but they too have their drawbacks, "for along all the French roads, particularly at the *maisons de poste*, the swarms of wretched, squalid-looking beggars almost interrupt the progress of your vehicle" . . . "so wretched and shocking were some of the objects, exposing all their bodily grievances, that it was absolutely necessary, in various instances, for decency's sake, not only to turn a deaf ear, but a blind eye, to such an exposed state of human misery."

His views on smuggling may give us our last quotation. Before leaving Paris he had several things to pack and arrange, "particularly what we intended to smuggle . . . as we found our persons only were exempt from a strict scrutiny." On reaching Brighton, the principal officer of customs "asked me if I would pass my word there was nothing contraband in my trunks. I said yes, excepting a few pairs of socks and stockings which were all marked and for private use. He asked if there were any liqueurs in them. I said no, and giving him a dollar for his civility, he let me take them away without even uncording them, which was curious, as he examined strictly and turned out almost all the other boxes of my fellow-passengers. Had I known that this would have been the case, how many little things could I have brought over at an easy rate; but this is such an entire uncertainty that I would never run the risk of detection. Indeed, as it was, having succeeded in landing my two bottles of noyau, in going upstairs at the inn I hit my pocket against the banister, and away went one of the bottles to smash, and I not only lost my noyau but almost spoiled my greatcoat with the sticky nature of the liqueur."

Old Ross-shire and Scotland, as seen in Tain and Balnagown Documents. By W. Macgill, B.A. (London). Inverness, 1909. *Price* 20*s.*

This book is a carefully prepared Calendar of the Documents in the Archives of the Royal Burgh of Tain, and in the Charter Chests of Balnagown Castle, with instructive notes. Beginning with a Charter in Latin, dated 1486, the documents dealt with go on to the closing years of the eighteenth century, and contain much information in regard to the local history of Ross-shire and the Northern Counties of Scotland, and picturesque illustrations of the life of the people, especially during the troublous times of our national history. They afford also a new field for the researches of the genealogist interested in Highland pedigrees. There is also material for the study of place-names, a puzzling subject, especially when one finds the same name spelt in three different ways in one document. The papers have been arranged in seven sections: (1) Church Affairs; (2) Education, Language, Medicine; (3) Law, Order, Politics, Revenue; (4) Social Matters; (5) Industries; (6) Covenant, Commonwealth, Revolution, Stuart Risings, and Highland Regiments; (7) Topography and Local History. Many documents deal with one or more of these sections, and generally cross references are given where this is the case. It is interesting to find the term "North Britain," usually regarded as invented in 1707, used in 1608. The manufacture of "faggot votes," which

has been described as the invention of Peebles lawyers of last century, is shown to have been actively practised by both sides in the Northern Counties in 1747. Emigration from the Highlands is shown to have begun earlier than the great clearances of the beginning of the last century. Thus we find Rev. Gilbert Robertson, minister of Kincardine, stoutly denying in 1772 that he had encouraged emigration. "What is a country without inhabitants, what are lands without people, what is a minister's charge without parishioners?" Fashions go in cycles; thus in an account rendered by an Edinburgh tailor to the Laird of Balnagown, in the reign of Charles II., we find a charge for a tailor-made gown and mantle for the lady. In 1750 we find the British Linen Company (incorporated in 1746) "spinning yarn with pretty good success" in Tain. George, third Lord Reay, managed his affairs with great success to the advantage of himself and his people. We get a glimpse of the attention he bestowed on business in a letter dated 27th October 1746, as to payment for cattle he had sold, and he adds—"I have got my butter sold at home." From a letter in 1691, we learn that "My Lord Arguile is fishing in the Sound of Mull for the Spanish gold that was cast in 1588." Statements to the same effect in recent newspapers show that the taste for this form of fishing has descended to the present day. Many letters illustrate the hardships all classes suffered in 1715 and 1745, and the cruelties of Cumberland are vividly portrayed. There is much material here to aid the historical novelist.

ASIA.

Peaks and Glaciers of Nun Kun. By Fanny Bullock Workman, Officier de l'Instruction Publique de France, etc., and William Hunter Workman, M.A., M.D., F.R.G.S., etc. London: Constable and Company, Limited, 1909. *Price* 18*s. net.*

In this handsome and beautifully illustrated volume Dr. and Mrs. Bullock Workman give a detailed account of another of their mountaineering expeditions, viz., that of 1906, when they explored the Nun Kun peaks and glaciers, which are situated in Eastern Kashmir. It is unnecessary for us, however, to give any detailed account of this very interesting expedition, because, in December 1907, Mrs. Bullock Workman was good enough to deliver an address on this subject in Edinburgh and at each of the Society's branches, and she also kindly consented to its publication in the January number of the *Magazine* for 1908. The feature of the expedition was the ascent of Pinnacle Peak, which stands some 23,300 feet above the level of the sea, and with regard to which Mrs. Bullock Workman says: "By this ascent of over 23,000 feet I not only broke my last woman's mountaineering record of 22,568 feet, but am to be included, I believe, in the small band of mountaineers who have climbed to 23,000 feet and over." Within the compass of an address it was, of course, impossible for Mrs. Bullock Workman to set forth more than a fraction of the scientific results of the expedition, or to describe the magnificent scenery, or the numerous personal incidents and adventures which occurred. Our readers will find abundance of them in the volume now published. But its distinctive feature is undoubtedly the illustrations. The letterpress contains some two hundred pages, and there are no less than ninety-two full-page illustrations which cannot be too highly praised. We have had of late years many illustrated books of mountaineering in all parts of the world, and it is not too much to say, that the illustrations of the *Peaks and Glaciers of Nun Kun* are second to none. As our book-list shows, Dr. and Mrs. Workman have kindly presented the Society with these illustrations, bound separately in album form.

As the members of the Society are well aware, Mrs. Bullock Workman is the

most distinguished of lady-mountaineers, and the volume now before us bears ample testimony to the courage, skill, endurance, and sangfroid, which have secured for her and her husband high places in the front rank of mountain climbers.

AMERICA.

The True History of the Conquest of New Spain. By Bernal Diaz del Castillo. Edited and published in Mexico by Genaro Garcia. Translated into English, with introduction and notes, by Alfred Percival Maudslay, M.A., Honorary Professor of Archæology, National Museum, Mexico. London: printed for the Hakluyt Society, 1908.

The value and interest to students of history and to antiquarians of this, the latest of the publications of the Hakluyt Society, are equal to those of any of its predecessors. The strange story of the book is related in a very interesting introduction contributed by Señor Don Genaro Garcia. The original manuscript, it appears, has always been, and is now, in Guatemala. In the sixteenth century a copy was sent to King Philip II. of Spain, which, mercilessly altered and garbled by Friar Alonzo Remon, was published at Madrid in 1632, passed through several editions, and although its inaccuracy and untrustworthiness were notorious, it was translated into several languages. In 1893 the government of Guatemala, through its ambassador, presented to the government of Mexico a photographic reproduction of the original manuscript, but with a condition that it should not be copied or printed. However, in 1901, Don Genaro Garcia persuaded the President of Guatemala to let him have another photographic copy of the original manuscript for the purpose of publication in Mexico, and with regard to this work Don Genaro assures us he has "taken care to religiously respect the original text, without introducing the slightest variation, not even of the artless orthography or punctuation." The English translation is the work of Mr. Maudslay, Honorary Professor of Archæology, National Museum of Mexico, who also contributes an interesting introduction and notes.

Don Genaro has with much labour and patience compiled a graphic and kindly narrative of the events in the life of Bernal Diaz, which we may condense into a few sentences. He was born in the famous year 1492, of a noble family, which had rendered good service to the Crown, and in 1514 he emigrated as a soldier to America in pursuit of wealth and fame. Nothing remarkable, however, happened to him till the year 1517, when he joined the abortive expedition of Hernandez de Cordova, which was badly beaten by the natives at Chanpoton, on the coast of Yucatan. In this expedition Bernal Diaz achieved neither glory nor riches, but instead he got three arrow wounds, one of them dangerous. In 1518 he went with Juan de Grijalva on a somewhat more successful expedition in the same direction. In February 1519 he joined the immortal expedition of Hernando Cortes, which resulted in the conquest of Mexico. It is this story by Bernal Diaz of these three expeditions, which, translated into English, is now being published by the Hakluyt Society. In this volume, however, we have only one part of the work. The expeditions of Cordova and Grijalva are disposed of in some sixty pages, after which the writer commences the narrative of the expedition under "that valiant and doughty captain, Don Hernando Cortes," of whom he is to the end an enthusiastic admirer, notwithstanding the injustice and ingratitude which he received at the captain's hands. This volume ends with the subjugation of the warlike Tlaxcalans, Cortes's entry into their capital, and the first overtures for peace on the part of Montezuma. Bernal Diaz had his full share of the hardships and fighting throughout the expedition, for the details of which we must refer our readers to the introduction; but he received little or nothing by way of reward.

At last, worn out with fatigue and smarting under the injustice of every Mexican tribunal to which he appealed, he decided to proceed to Spain to plead his cause in person at the Court, and this he did in 1540. He found, however, that to get justice or money was no easier at the Court of Spain than in Mexico, but he did succeed in getting two royal decrees in his favour, armed with which he returned to Mexico. One was ignored altogether; the other was carried out in Guatemala by the assigning to him of three worthless towns, so that his financial position was in no way improved. He paid another visit to Spain in 1550, and returned to Guatemala, where he spent the rest of his days in poverty but held in general respect. He died in 1581. He was over seventy years of age when he began to write his *True History*, one of his objects being to correct current erroneous accounts of the doings of the expedition. His work was interrupted in various ways, and we learn from himself, that when he finished it he was an "old man over eighty-four years of age who had lost his sight and hearing." Bearing this in mind, we cannot but admire the courage, perseverance, and memory of the writer. Indeed his power of memory, especially of common details, must have been quite exceptional. For example, writing after an interval of nearly fifty years, he gives us a description of each of the sixteen horses, which Cortes took with him in 1519, and the name of the owner, *e.g.* "Juan de Ercalante—a light chestnut horse with three white stockings, not much good. Diego de Ordas, a grey mare, barren, tolerably good, but not fast." A whole-hearted loyal Catholic, he was not deficient in humour, as, for example, when he records that at Cempoala "the niece of the fat Cacique was named Doña Catalina, and she was very ugly; she was led by the hand and given to Cortes who received her *and tried to look pleased*." Mr. Maudslay has summed up the impression which Diaz makes on the reader in a sentence, when he says, "The character of Bernal Diaz himself shows clearly enough in his story; it is that of a lovable old soldier such as novelists have delighted to portray in Napoleon's "Old Guard," simple, enduring, splendidly courageous and unaffectedly vain.

In his learned, but far too brief, introduction Mr. Maudslay describes the extant records of the conquest of Mexico by the hands of eyewitnesses, and the general physical features of Mexico and Central America; and he discusses the vexed question of "Who were the Mexicans, and how did they get to Mexico?" to which he admits he is not prepared now to give a final answer. He has also some judicious remarks on the moral aspects of the conduct of the Spaniards, who manifestly ought not to be judged by the standards of the twentieth century. But this subject may be reserved till we have the whole of the *True History* before us. We must not forget to add that the volume is equipped with two excellent maps, and several rare and quaint illustrations. We cordially recommend it to the perusal of our readers.

BOOKS RECEIVED.

Die Vegetationsverhältnisse der Balkanländer (Die Vegetation der Erde). Von Prof. Dr. Lujo Adamovic. Large Demy 8vo. Pp. xvi + 567. *Price* 30 *m.* Leipzig: Verlag von Wilhelm Engelmann, 1909.

Illustrations made from Photographs taken on the Bullock Workman Expedition to the Nun Kun, Himalaya, in 1906, *used to illustrate the Author's Book entitled "Peaks and Glaciers of Nun Kun."* Demy 8vo.

[Presented to the Library by Fanny Bullock Workman and Wm. Hunter Workman, Dec. 1909.]

Romantic Corsica: Wanderings in Napoleon's Isle. By GEORGE RENWICK. With a Chapter on Climbing by T. G. OUSTON, F.R.C.S. With 67 Illustrations and a Map. Demy 8vo. Pp. 333. *Price* 10*s.* 6*d. net.* London: T. Fisher Unwin, 1909.

The Face of the Earth (*Das Antlitz der Erde*). By EDWARD SUESS. Translated by HERTHA B. C. SOLLAS under the Direction of W. J. SOLLAS. Vol. IV. Royal 8vo. Pp. viii + 696. With 55 Illustrations. *Price* 25*s. net.* Oxford: At the Clarendon Press, 1909.

Cambridgeshire (*Cambridge County Geographies*). By T. M'KENNY HUGHES, M.A., F.R.S., and MARY CAROLINE HUGHES. Cr. 8vo. Pp. xiv + 272. With Maps, Diagrams, and Illustrations. *Price* 1*s.* 6*d.* Cambridge: University Press, 1909.

Travel and Exploration. Vols. I. and II. 4to. London: Witherby and Co., 1909.

Handbuch der Klimatologie. Von Dr. JULIUS HANN. Band II. Demy 8vo. Pp. xii + 426. *Preis* 14 *m.* Stuttgart: J. Engelhorn, 1910.

Other Lands (*The Scholar's Book of Travel*). *Pt. 3—Literary Extracts from the Best Book of Travel.* Cr. 8vo. Pp. vii + 200. *Price* 1*s.* 3*d.* London: George Philip and Son, Ltd., 1910.

The British Empire (*The Scholar's Book of Travel*). *Pt. 4—Literary Extracts from the Best Books of Travel.* Cr. 8vo. Pp. vii + 200. *Price* 1*s.* 3*d.* London: George Philip and Son, Ltd., 1910.

La Guyane: Au Pays de L'Or, des Forçats et des Peaux-Rouges. Par le Docteur J. TRIPOT. Un Volume in 16. Pp. viii + 301. *Price* 21 *francs.* Paris: Librairie Plon-Nourrit et Cie, 1910.

Longman's Gazetteer of the World. Edited by GEORGE G. CHISHOLM, M.A., B.Sc. London: Longmans, Green and Co., 1906. (Purchased.)

NEW MAPS.

EUROPE.

ORDNANCE SURVEY OF SCOTLAND.—The following publications were issued from 1st to 31st October 1909:—

One-inch and Smaller Scale Maps.—One-inch Map (third edition), printed in colours and folded in cover, or flat in sheets. *Rum*, Sheet 60; *Arisaig*, Sheet 61. Price—on paper, 1s. 6d.; mounted on linen, 2s.; mounted in sections, 2s. 6d. each.

Six-inch and Larger Scale Maps.—Six-inch Maps (Revised). Quarter Sheets, with Contours. Price 1s. each. *Ayrshire.*—48 SE.; 50 SE.; 71 SW. *Kirkcudbrightshire.*—23 SE.; 31 NE.; 32 NW., 32 SW.; 40 SW.; 41 SE.; 44 SE.; 49 SE.; 56 SW. *Peeblesshire.*—10 NW.; 14 NE.; 17 NW., 17 SW.; 18 NE.; 20 NE., 20 SW., 20 SE.; 21 NW.; 24 NW. *Wigtownshire.*—2 SW.; 3 SE.; 4 SE.; 6 SW.; 7 NW., 7 NE., 7 SE.; 8 NE., 8 SE.; 9 NW., 9 SW.; 11 NE.; 12 NW.; 17 NE.; 18 NE.; 20 NW., 20 SW., 20 SE.; 22 SW., 22 SE.; 35 NW.

1 : 2500 Scale Maps (Revised), with Houses stippled, and with Areas. Price 3s. each. *Ayrshire.*—Sheets XXIV. 7, 14; XXV. 16; XXV. 13, 14, 15; XXIX. 2, 3, 4, 5, 7, 8, 11, 12, 13, 14, 15, 16; XXX. 1, 3, 4, 5, 7, 8, 9, 12, 13; XXXI. 1, 2, 3, 5; XXXIII. 11; XXXIV. 2, 3, 4; XXXV. 1, 2, 4, 5, 6, 7, 8, 11, 16; XXXVI. 1.

Note.—There is no coloured edition of these Sheets, and the unrevised impressions have been withdrawn from sale.

The following publications were issued from 1st to 30th November 1909 :—

One-inch and Smaller Scale Maps.—Two Mile Map, printed in colours and folded in cover, or flat in sheets. *Skye.*—Sheet 11. Price—on paper, 1s. 6d.; mounted on linen, 2s.; mounted in sections, 2s. 6d.

One-inch Map (third edition), engraved, in outline. Sheet 80. Price 1s. 6d. Third edition, engraved, with hills in brown or black. Sheet 76. Price 1s. 6d.

Third edition, printed in colours and folded in cover, or flat in sheets. *Forfar.*—Sheets 57 and 57a. *Loch Eil.*—Sheet 62. *Glen Roy.*—Sheet 63. Price—on paper, 1s. 6d.; mounted on linen, 2s.; mounted in sections, 2s. 6d. each.

Diagrams—county. Scale four miles to one inch, showing civil parishes, with a table of their areas. *Caithness.*—Price 6d.

Six-inch and Larger Scale Maps.—Six-inch Maps (Revised). Quarter Sheets, with Contours. Price 1s. each. *Ayrshire.*—63 NE., 63 SE.; 68 NW.; 72 NW.; 73 NE. *Kirkcudbrightshire.*—10 SE.; 15 NW.; 16 SW.; 18 NW.; 23 NW.; 35 SW.; 36 SW.; 39 NW., 39 NE.; 42 NW., 42 NE.; 45 NW.; 46 NE., 46 SE.; 47 SE.; 48 SW.; 51 NW. 51 SW. *Peeblesshire.*—14 SE. (24 SW. and 24 SE.). *Wigtownshire.*—3 NW.; 5 NE.; 13 SE.; 14 NE., 14 SW.; 15 NW., 15 NE.; 21 NE., 21 SE.; 26 NW.

1 : 2500 Scale Maps (Revised), with Houses stippled, and with Areas. Price 3s. each. *Ayrshire.*—Sheets XXIV. 6, 10; XXVII. 10, 11, 12, 14; XXVIII. 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; XXIX. 1, 6, 9, 10; XXXII. (16 and 15); XXXIII. 2, 3, 4 (5 and 1), 7, 8, 9, 10, 12, 15; XXXIV. 5, 9; XXXVIII. 4; XXXIX. 1, 2, 3.

Note.—There is no coloured edition of these Sheets, and the unrevised impressions have been withdrawn from sale.

The following publications were issued from 1st to 31st December 1909 :—

Two Mile Map, printed in colours and folded in cover, or flat in sheets. *Stromeferry.*—Sheet 12. *Inverness.*—Sheet 13. *Elgin and Huntly.*—Sheet 14. *Peterhead and Inverurie.*—Sheet 15. Price—on paper, 1s. 6d.; mounted on linen, 2s.; mounted in sections, 2s. 6d. each.

One-inch Map (third edition), engraved, with hills in brown or black. Sheets 80, 97. Price 1s. 6d. each.

Third edition, printed in colours and folded in cover, or flat in sheets. *Fort Augustus.*—Sheet 73. *Grantown-on-Spey.*—Sheet 74. *Tomintoul.*—Sheet 75. Price—on paper, 1s. 6d.; mounted on linen, 2s.; mounted in sections, 2s. 6d. each.

Diagrams—county. Scale four miles to an inch, showing civil parishes, with a table of their areas. *Edinburghshire.*—Price 6d.

Six-inch and Larger Scale Maps.—Six-inch Maps (Revised). Quarter Sheets, with Contours. Price 1s. each. *Ayrshire.*—59 NW. (60 SE. and 61 SW.); 65 SE.; 66 NW., 66 SW. *Kirkcudbrightshire.*—7 NW., 7 SE.; 13 NW.; 19 SE.; 24 NW.; 34 NE.; 43 NW., 43 NE., 43 SE.; 44 SW.; 45 SW.; 47 NW., 47 SW.; 50 NE.; 52 NW.; 55 NW.

1 : 2500 Scale Maps (Revised), with houses stippled, and with areas. Price 3s. each. *Ayrshire.*—Sheets XXI. 16; XXII. 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; XXIII. 16; XXIV. 13 (XXV. 1 and XX. 14); XXVII. 1, 2, 3, 4, 7, 8, 15, 16; XXVIII. 1, 2, 3, 4; XXXIII. 6, 13, 14; XXXIV. 1.

Note.—There is no coloured edition of these Sheets, and the unrevised impressions have been withdrawn from sale.

GEOLOGICAL SURVEY OF SCOTLAND.—The following publications were issued from 1st to 31st October 1909 :—

One-inch Map (Solid and Drift editions). *Kilmartin, Isles of the Sea.*—Sheet 36. Price 16s. 3d. each.

Sheet Memoir.—The Geology of the Seaboard of Mid Argyll, including the Islands of Luing, Scarba, the Garvellachs, and the Lesser Isles, together with the northern part of Jura and a small portion of Mull. (Explanation of Sheet 36.) ; by B. N. Peach, LL.D., F.R.S. ; H. Kynaston, B.A., and H. B. Muff, B.A., with contributions from S. B. Wilkinson, J. S. Grant-Wilson, J. B. Hill, R.N., A. Harker, M.A., F.R.S., E. B. Bailey, B.A., and Petrological Notes by J. S. Flett, M.B., C.M., D.Sc. Price 2s. 3d.

The following publications were issued from 1st to 31st December 1909 :—

Six-inch Maps. Quarter sheets, uncoloured. Price 1s. 6d. each. *Lanarkshire.*—7 NW., 7 SW., 7 SE.

ADMIRALTY CHARTS. SCOTLAND.—Firth of Clyde and Loch Fyne. New Edition, October 1909. No. 2159. Price 4s.

Upper Part of Loch Long, and Loch Goil, December 1909. Scale 1 : 24,355. No. 3739. Price 3s. *Admiralty Office, London.*

GEOLOGICAL MAP OF SCOTLAND.—Reduced chiefly from the Ordnance and Geological Surveys under the direction of Sir Archibald Geikie, K.C.B., Pres. R.S. Topography by John Bartholomew, F.R.G.S. Scale 1 : 633,300, or 10 miles to an inch. With Explanatory Notes by Sir Archibald Geikie. New Edition, 1910. Mounted on cloth, dissected, in case. Price 7s. 6d. net.

John Bartholomew and Co., Edinburgh.

This map will be noticed elsewhere.

LONDON ENVIRONS.—Bartholomew's Contoured Map, showing all roads for motorists, cyclists, and pedestrians. Scale 1 inch to a mile. 1910. Price 1s. in case, or 2s. mounted on cloth. *John Bartholomew and Co., Edinburgh.*

This map is on a large enough scale to show clearly all the roads in the neighbourhood of London. The contour colouring brings out very effectively the valley of the Thames and the outlying hills.

RUSSLAND.—Flemming's Namentreue (idionomatographische Länderkarten, Blatt. 1. In flächentreuer Kegelrumpfprojection mit 2 abweitungstreuen Parallelkreisen. Mittlerer Massstab, 1 : 4,500,000. Herausgegeben von Prof. Dr. A. Bludau and Otto Herkt. *Carl Flemming, Berlin und Glogau.*

This is the first of a new series of maps prepared in connection with Messrs. Flemming's Sohr-Berghaus Atlas. The special features of these "Idionomatographic" maps is that places are represented on the map by the local names in each country ; in fact, by the correct names. Thus Naples would appear as Napoli, Moscow as Moskva, Constantinople as Istambol. In the case of such well-known and accepted forms as the foregoing, a concession is made by printing the foreign name underneath in brackets. Thus we have "Cernoe More" (Black Sea). The advantages of knowing the true names of places are so obvious that we venture to think this new departure will be as much appreciated by geographers as it certainly will be welcomed by travellers.

In other respects this new map of Russia is an excellent specimen of the latest German cartography.

AFRICA.

AFRICA.—Map to illustrate the progress of surveys and explorations. Scale 1 : 20,000,000. 1909. Price 6d.

Geographical Section, General Staff, London.

This interesting and useful map shows to what extent different parts of Africa are surveyed and mapped. It distinguishes, in the first place, regions with surveys which may be taken as exact for reproduction on the scale of 1 : 250,000 ; secondly, surveys and explorations of an intermediate class ; and lastly, regions with only rough explorations. It notes that the whole coast-line of Africa has been charted by the Admiralty. Plans with longitudes determined by telegraphic comparisons have been underlined in black. Surveys on British and Egyptian territory are coloured red ; on foreign territory they are in blue.

UGANDA-CONGO COMMISSION, 1906-1908. Scale 1 : 250,000, or about 4 miles to an inch. Sheets—Lake Albert, Lake Edward, Bulegga, and Fort Portal. 1909. Price 2s. 6d. each sheet. *Geographical Section, General Staff, London.*

KAMERUN. - Massstab 1 : 1,000,000. Blatt No. 4. Tschad. Blatt No. 6. Ngaumdere. Bearbeitet von Paul Sprigade und Max Moisel. Herausgegeben vom Reichs-Kolonialamt. 1909. *Dietrich Reimer (Ernst Vohsen), Berlin.*

These sheets of an important new map of the Cameroons are just issued as a section of the new edition of the "Grosser Deutscher Kolonialatlas" now being published in parts. They form a most valuable contribution to the International one-millionth map of Africa.

NORTH AMERICA.

ONTARIO AND QUEBEC.—Standard Topographical Map. Scale 1 : 250,000, or about 4 miles to an inch. Pembroke Sheet (9 SE.). 1909. James White, F.R.G.S., Geographer. *Department of the Interior, Ottawa.*

ONTARI AND QUEBEC.—Topographic Map. Scale 1 : 63,360, or 1 mile to an inch. Contours at intervals of 25 feet. Sheets—No. 21, Huntingdon ; No. 22, Laval ; No. 23, Lachine ; No. 25, Vaudreuil. (Department of Militia and Defence, Ottawa, 1909.)
Geographical Section, General Staff, London.

UNITED STATES SURVEY.—Topographical Sheets. 1909.
Scale 1 : 24,000. New Mexico, Santa Rita Special Map.
Scale 1 : 36,000. Tennessee, Ducktown Special Map.
Scale 1 : 48,000. Colorado, Pike's Peak Special Map.
Scale 1 : 62,500. Georgia, 1 ; Illinois, 1 ; Kentucky, 2 ; Maryland, 2 ; Michigan, 1 ; Missouri, 1 ; New York, 1 ; North Carolina, 1 ; Ohio, 2 ; Pennsylvania, 1 ; South Carolina, 1 ; Tennessee, 1 ; Washington, 1 ; West Virginia, 6 ; Wisconsin, 2.
Scale 1 : 125,000. Arizona, 1 ; California, 2 ; Colorado, 1 ; New Mexico, 1 ; Oklahoma, 2 ; Utah, 1.
Scale 1 : 250,000. Montana, 1. Reconnaissance Map of Rampart Quadrangle, Yukon-Tanana Region, Alaska, 1. Reconnaissance Map of the Fairbanks Quadrangle, Alaska, 1.

(The figures after the name of each State indicate the number of new sheets received.) *United States Geological Survey, Washington, D.C.*

THE SCOTTISH

GEOGRAPHICAL

MAGAZINE.

THE GEOGRAPHICAL STUDY OF GREEK AND ROMAN CULTURE.[1]

By Professor JOHN L. MYRES, F.S.A.

(*With Sketch-maps and Illustrations.*)

THE object of this paper is to illustrate the contributions which are made to our knowledge of the civilisation of Greece and Rome, through the scientific study of the geography of the Mediterranean basin, the region within which the culture of the classical world had its cradle and its career. We must, in any case, regard this civilisation as representing a mature and highly successful attempt on the part of the human population of this region to *live well* under Mediterranean conditions; and if we once take this view of the civilisation itself, it becomes obvious that our next business is to become familiar with the natural facilities and obstacles which are offered by the Mediterranean world to human advancement of any kind; the structure and forms of its land-masses, and the distribution of its sea-basins among them, the rigours and amenities of its climate, the characteristics and habits of its plant and animal population. Only then can we feel ourselves free to turn to Man himself: to classify and distinguish the varieties of mankind which exist in Mediterranean lands, either as ancient occupants or as intruders from elsewhere. In the case of the latter, we have to ask whence they have come, by what avenues they got in, and over what parts of the region they have been successful in maintaining their hold. This should lead us to cases in which the physical forces of the Mediterranean region itself have exercised a selective control over the men on whom they have operated, preserving here, and eliminating

[1] An address delivered to the Society in Edinburgh, on February 3, 1910.

there, according as man has known under the given conditions how to conquer or to conform: and this in turn should reveal the different modes of livelihood by which this or that type of human society has discovered how to maintain itself, and the social and political institutions which it has been able to establish on this elementary compromise with nature.

The Practical Aspect of the Question: Classical Geography in Secondary Schools.

This, in broad outline, is the group of studies, of which I can only hope here to touch the fringe and select a few typical incidents. It has, of course, its own abiding value; but it has also, I think, a certain temporary interest in view of the predicament in which the study of classical culture has been placed by the recent trend of experiment in the world of education; for in the revolution now in progress in the methods of secondary education, no group of subjects has had its claims more closely scrutinised, or its educational value more widely questioned, than that which deals with the ancient civilisation of the Mediterranean world,—with the culture of Greece and of Rome that is,—as revealed through their languages, and illustrated by their literature and art. With the methods or the value of a classical education based mainly upon the study of languages and literature, we are not here, of course, directly concerned at all; but I think it may bring what I have to say into practical contact with a large and urgent question if I note, at the outset, that alongside of purely linguistic and literary study, British scholarship has always maintained the tradition that classical education demands also a living acquaintance with the societies in which these literatures were created: with the political and social institutions which gave them form and coherence; and, in outline at least, with the economic background and geographical environment in which those societies had occasion to develop at all.

Now it unfortunately happens that in the current congestion of subjects in our schools, and the consequent restriction of the time allowed for classical studies, it is this aspect of the classics which has in fact suffered first and most severely, simply because current methods of teaching the classics tend to postpone history and sociology until considerable progress has already been made with both language and literature: the result, of course, being that, with restricted allowance of time throughout, it is the latter part of the curriculum which has suffered most mutilation, and is reached by the fewest students. I should be among the last, I hope, to heap criticism unnecessarily on a subject which has already received more than its share: but I confess that, little as the majority of classically-trained students retain of serious acquaintance with the languages and literatures of the classical world, their proficiency is in startling disproportion to their knowledge of that world itself, in its Mediterranean setting, and with its very peculiar structure and mode of life, delicately adjusted as it was to the conditions of Mediterranean life.

All this would be regrettable enough, in any event, but it is particularly unfortunate that this mutilation of classical studies in the majority of the schools should have occurred in a generation of scholarship which will be remembered as that which first brought into clear scientific light precisely this aspect of Greece and Rome, as one supreme and unique experiment in the adaptation of human life to a well-defined regional environment. The rapid relaxation, during the nineteenth century, of Turkish rule in the Eastern Mediterranean, no less than the improvement of the means of communication in Italy and Sicily, coincided happily in time with vast developments, north of the Alps, in the application of the stricter methods of natural science to the study of the ways of man. The first result was the creation of that classical archæology, which has been so lately and worthily chronicled by Dr. Adolf Michaelis,[1] and which has made the study of ancient art and all the material equipment of ancient life almost as accessible to students as the remains of ancient literature. A second and more gradual outcome is the growth of a classical geography of the Mediterranean region, considered as a regional whole, exercising a control over man's operations within it, which has always been felt to be profound, and is now increasingly demonstrable as such. And the large part which British explorers have taken in accumulating the data, and laying down the broad outlines of this offshoot of classical study, suggests a further reason for giving to it in our handling of classical antiquity the consideration which it naturally deserves.

In a paper which I had the privilege of submitting last year to the Classical Association of Scotland at its meeting in Aberdeen, I attempted to deal with this subject of Mediterranean geography from the point of view of a teacher of the classics who desired to keep his subject abreast of the best modern work on this side. I pointed out the economy and the real gain in efficiency which might be expected to result from a closer correlation of classical with geographical teaching; and particularly from the treatment of the history and institutions of the Mediterranean peoples as the outcome of Man's attempt to live efficiently under Mediterranean conditions. Human progress, as I pointed out, has passed through three principal phases, correlated each with its own geographical theatre of operation: first, a phase in which the sole centres of advancement were the irrigable valleys of great rivers such as the Nile and the Euphrates; next, one in which the inhabitants of a ring of lands facing inwards upon the shores of a midland sea, made interchange of commodities and ideas possible by intercourse upon its waters, and created what in its final form became the *Orbis Terrarum*, the circuit of lands which constituted the Empire of Rome; thirdly, an Atlantic phase, in which three successive discoveries reveal the facts, (1) that Europe is not merely a part of a Mediterranean land-ring, but is a peninsular region with an oceanic seaboard of its own; (2) that this oceanic seaboard of Europe is itself one section of a new "circuit of lands," which embraces

[1] *Die Archaeologische Entdeckungen der Neunzehnten Jahrhundert.* Munchen, 1906. English translation: *A Century of Archæological Discovery*, by Miss B. Kahnweiler. London: Murray, 1908.

both shores of an inter-continental gulf—the North Atlantic; (3) that this inter-continental gulf itself communicates with an outer ocean, round the promontories of Africa and South America; (4) that the largest continental masses of our planet have themselves, like Cæsar's Europe, a reverse flank facing on a more outward ocean still: so outward indeed, that it is more appropriately to be regarded, for the future at all events, as an inter-continental basin in itself, bounded by a new *Orbis Terrarum*, the Pacific coasts of America, Asia, and Australia.

It is of course only with the second of these three great stages of human experience and experiment that we are concerned when we deal with the geography of Greece and Rome; but I think that it helps somewhat to put classical history and geography into proper setting and perspective, if we allow ourselves thus, in a preliminary way, to look before and after, and to grasp, even in outline, the part which Mediterranean culture has played in the world, as the heir of the Old World of the River Cultures, and as the pioneer in the foundation of much that is of the most permanent value in our modern world of the North Atlantic.

In my Aberdeen paper I suggested also that one reason why the descriptions which have come down to us of life under Mediterranean conditions sound at first so strange and distant, is not that Greeks or Romans were men of other nature than our own, but simply that the problems of living which they had to solve were different problems from those which face us; and that the differences arose from the fact that the means and materials for a good life which the Mediterranean world offers are different from those of the Atlantic seaboard of Europe, and the obstacles to good living different likewise; often in most unexpected ways. Now there is nothing which arouses so surely what I may call the "Robinson Crusoe" instinct of the average child of school age, as to be confronted with such correlations of means to ends, and of human effort to natural obstacles, as those which with a little attention we can see revealed on every hand in the standard accounts of Greek and Roman life. The problems offered by that life also are for the most part relatively simple ones: societies were young and unencumbered by a long heritage of alien custom: commerce and industry were in their infancy; and the majority of mankind maintained themselves by far more direct wrestling with Nature for Nature's gifts, than is the case with the members of modern industrial centres. Under such conditions, the relation of cause and effect is, as we should expect, much easier to grasp and to formulate: clear questions are easier to ask, and the answers suggest themselves. There is the further advantage, from the educational point of view, that though the great Mediterranean societies are so different from our own in their structure and objects, they nevertheless stand linked with ours in intimate historical sequence. The higher thought of both Greece and Rome plays a dominant part still in the thinking life of the modern world; and in tracing it back to its cradle, in Greek and Roman life, we are studying in a real sense the origins of a great part of ourselves.

To develop this line of study in detail would obviously require many

essays such as this: and I have dwelt as fully as I have with the practical and educational aspect of my subject mainly with the object of securing a point of view sufficiently limited to justify the choice of the illustrations which follow. They are all intended to be such as might be included in the early part of a course of ancient or classical geography, which should at the same time form a systematic analysis of the geography of the Mediterranean region, and serve to give coherence and reality to the subject-matter of courses in classics and ancient history.

The Structure of the Greek World.

We are accustomed to a conception of the ancient Greeks which presents them to us as a people of unique genius, pioneers in every line of human progress, and in more than one direction unsurpassed in realising what their reason or their fancy devised. But we are not so well accustomed to conceive of the Greek world, the theatre of their achievements, as a region of the earth's surface almost as unique as they. So peculiar is it, however, considered merely as a geographical region, that the student of things Greek who allows himself, as so many do, to remain unfamiliar with its purely physical characteristics, seems to me to approach Greek civilisation in a perverse and inadequate way. The gap in his knowledge, the blind spot in his power to see, can hardly fail to lose him the significance of much that enhances the colour and deepens the perspective of the picture as read by a geographer.

To take a simple, practical example, the current maps of Greece, which appear in the majority of ancient atlases, seem to distort and disfigure almost wilfully the proportions of the land-masses and their relation to the seas which surround them. To present the home of the Greeks to the student as an isolated peninsula, beginning nowhere, up in the north-west, and pointing nowhere with its long fingers, except towards a meaningless half-constellation of Cycladic islands, is to miss the whole significance of the land structure, with its complex of mountain-folds, and its gradual subsidence below sea-level, as it passes into the Ægean depression: and to give quite false values to the very different seas which are spread, for example, before Athens and before Patras. It is a geographic blunder on a par with that diplomatic blunder of the last century, which drew a political frontier between Greece and Turkey with such astronomical accuracy that it bisected between hostile governments two separate islands, neither of them as large as Guernsey. The Greek cradle and home in fact are not, and never have been, on the mainland of Greece exclusively: the modern Greek kingdom is a compromise of the politicians; the art, and thought, and commerce of classical Greece began, and long continued to grow, on the Asiatic shores, before Corinth and Athens awakened from the paralytic slumber of the Dark Ages which followed the Minoan *débâcle*.

To include in our maps the east and north shores of the Ægean, however, is not yet enough to bring out the full force of the geography of Greek lands. We can see, indeed, now, how the four coasts of the Archipelago fall apart into two groups; the continental frontages of

Thrace and Ionia, and an insular and peninsular screen consisting of Crete and Greece itself: and we can trace this contrast operative in the early ages, with its diagonal limit imposed on Mycenæan settlements, on Agamemnon's confederacy, and on the alliances of King Priam; and separating the new growth-points of Hellenic Ionia and Chalcidicé from the area of renaissance where the Minoan cities and Achæan states had been.

But it takes a larger map still, at least as comprehensive as the type represented by Kiepert's *Balkan-halbinsel* wall-map, to show fully how completely the Ægean basin contrasts with the great deeps "above Crete" (as Homeric navigators put it), to the south, that is, and to the west of the insular-peninsular shore-line: how the Ægean itself is not so much open water as submerged land, with its hill-tops still projecting into dry air: and how, nevertheless, beyond the trackless, islandless waters of the west, and encircling them by way of the north, lay other shores, hospitable and accessible in succession, and destined to become in a true sense *Magna Græcia*: with a Tarentum, a Croton, and a Sybaris to set new standards of achievement in commerce and culture, and a Syracuse to tempt Athens to her fall.

Even now, however, both the sea-basins and the main lines of the land-structure still outrun the printed page: and they continue to do so until we concede to the Greeks their own eventual frontier lines, which are those of the Mediterranean Sea, with its Euxine annexe up the "Hellespont river": for the range of Greek colonies extends from the Ebro to the Don and the Nile. This wholesale mastery of the sea-ways, and thereby of so large a proportion of the coast-line, depends, as we now see, directly on the peculiar structure of the Ægean itself, an ideal nursery of seamen, and on the remarkably favourable position which this basin holds in regard to the Mediterranean as a whole. For in the Eastern Mediterranean, which lies wholly clear of the great Alpine folds, Greece, lying as it does on the north side, had no rival to fear on the other. Egypt, as we know, lies withdrawn up-Nile, behind its delta-screen; Cyrene is but an island, washed indeed by sand-waves on its southern shores, but none the less insular for that: even Phœnicia is but skin-deep if we probe it from the sea, and acquired such occupancy as it did in the Mediterranean world to the fact that in the centuries of its aggression there were for the moment few or no Ægean ships afloat. Contrast with this the intermont basin of the west; there was a Rome, it is true, on the north shores, backed in due course by Italic Italy, and by Greek friends further south from Naples to Syracuse; but there was place also for a Carthage on the south, Phœnician in its origin, but African in its career: grasping in one business-like hand the caravan-routes to the Niger and the Pygmies, the mineral resources of Spain, and the cornfields of her own *hinterland*: and guarding all with the matchless horsemen of Numidia, whom Hannibal was to launch into Italy.

As with the sea, so too with the mountains. If we are to do justice to the wild uplands which appear at first sight to shut in Greece on the north, we must place these also in their setting, as one section of the

FIG. 1.—Mediterranean Temperatures in January.

The space between the isotherms of the Riviera (8° C.) and of Cairo (14° C.) is blackened, showing the moderating (*warming*) influence of the Mediterranean water basins. The dotted line (isotherm of Lyons, 6° C.) shows the similar influence of the Black Sea. The line + + + is the isotherm of Sinai (18° C.).

FIG. 2.—Mediterranean Temperatures in July.

The space between the isotherms of Genoa—Barcelona—Constantinople (24° C.) and of Cairo (26° C.) is blackened, showing the moderating (*cooling*) influence of the water basins, and the aggravating influence of the land masses.

Alpine fold from the Pyrenees to Ararat: we must learn to compare their feigned protection with that other splendid traitor, the Alpine frontier of Italy: and just as we instinctively think of Palestine as the "good land this side Jordan," we must learn to grasp the Alpine zone and its foot-lands towards the Midland sea, as the "good land this side Danube," the recurring cynosure and prey of nomads and foresters from the north.

To clear up the features of the Greek cradle-land, this Mediterranean commentary might perhaps suffice. It is not, however, until we replace the Mediterranean region itself in its own geographical setting, as we have already replaced the Ægean, that we see fully how remarkable its position is in relation to the Old World as a whole. Note how centrally the Greek lands lie, in the heart of the Eastern Mediterranean; and then see how centrally the Mediterranean lies, between the River Cultures of the Ancient East on the one side, and the Transalpine, Atlantic-facing regions from the Garonne to the Vistula, which are the cradle of our modern world. See, no less, how it lies encircled on nearly three sides by three of the great flatlands and grasslands of the planet, in North Africa, in Arabia, and in the great level between the Carpathians and the highland core of Asia; beset, therefore, and for ever threatened, in its human aspect, by three great reservoirs of unspent Man: the Libyan enemies of ancient Egypt, the Semites of Arabia, and the Aryan-speaking folk of the mainland North. See, once again, how not merely its rocky framework with its envelope of sea, but in the same way its vegetation, too, stands centrally distributed, as a highly specialised and most characteristic type, between the grassland flora of the regions just named, and the dense, deciduous forests of Central Europe: and how this Mediterranean type of vegetation, in its turn, is controlled by, and accurately conformable to, an intermediate regime of wind, rainfall, and temperature, with very special and emphatic sequence of seasonal changes round the year.

Note, finally, how intimately this climate and this vegetation are associated with the geographical form and feature of the Mediterranean region; how closely they fit its outline, and fade away when the influence of this midland sea wanes: how essentially "Mediterranean" in fact they really are.

Climate and Vegetation.

When we speak of "going to the Mediterranean" we mean, I imagine, that we are in search of a climate at least as warm and sunny as that of the Riviera in midwinter (from Barcelona to Genoa), and at least as moderate as that of Cairo at the same season. So I have made the experiment of tracing the course of the January isotherms of this typical locality (cf. map, p. 119), with the object of discovering what the actual distribution of the Mediterranean weather will be. The result is instructive: the great sea-basin clearly serves as a gigantic hot-water apparatus for the whole of its northern coasts, and at the same time as a markedly moderating influence over a large area to the south. This

Cultivation of Olive, with cornland among the trees. Tunis.

Olive and aromatic shrubs in an irrigated garden in Palestine.

latter extension of Mediterranean climate is, of course, mainly due to the prevalence, even in the winter, of northerly and north-easterly "trade-winds." The July isotherms (cf. map, p. 119) of the same typical localities show even more instructively what a moderating and cooling influence the Mediterranean Sea exercises in the hot seasons on the neighbouring lands; and at the same time how sensitively the heat-lines respond to the presence of land-masses within this watery region, as in Sicily and Asia Minor. The southward displacement of the thermal "shadow" of Asia Minor and the Balkan lands, is again to be attributed to the strong north-easterly winds.

The distribution of the rainfall (see map, p. 123) suggests similar thoughts. Clearly the prolongation eastwards, into the heart of a continental land-mass, of the more copious rains is the consequence of the existence of this large group of midland water-basins; though clearly, also, the high rainfall of the Balkan lands, Asia Minor, Armenia, and Caucasus, results from the prolongation eastwards of the great highland belt, of which we have traced the course already.

More important than the total annual amount of the rainfall, is its distribution among the seasons. In this respect it is only the Eastern Mediterranean which actually presents unmodified the "Mediterranean climate" of the geographers, with the whole of its rain in the winter, and none between May and October; and even here most of the highland zone is exempted from this drought by its altitude. In the Western Mediterranean, too, the contrast is emphatic between the quite rainless summer of Algeria, Tunis, and Sicily, and the qualified climate of Italy and the north of Spain. Summer grass, in fact, and with it the possibility of a cattle industry, extends locally south of the latitude of Naples.

Subject, however, to these small differences locally, the Mediterranean world enjoys, on the whole, a homogeneous and very well-marked type of climate: with a short winter, mild, stormy, and wet; in which all green things grow apace from October onwards, quite reversing the procedure of our northern plant-world. This growing-season culminates in a shortened spring, brilliant with flowers and green cornfields. Then comes the long, rainless summer. "The grass withereth, the flower fadeth"; "the place thereof knoweth it no more." Corn ripens and is cut in June and July: and long before that, the annuals, bulbs, and fibrous-rooted anemones have all settled down for summer slumber. Only a few deep-seated lilies, and highly specialised trees like the olive and the vine, stretch roots far down enough to maintain their fertility till autumn. Apart from these, and the irrigated gardens of man, the only types of vegetation which can endure the sun's oppression and the ravages of the goats, are dwarf evergreen shrubs, leathery, prickly, and aromatic; the last-named quality resulting from an annual coat of varnish which they exude, to close their pores, and check evaporation in the great heats.

This evergreen scrub or *maquis* is the standard vegetation of the Mediterranean world, common to all its shores; and all the paradise spots which have made the region famous for its plant-beauty are isolated here and there within it like oases. There is, of course, endless gradation

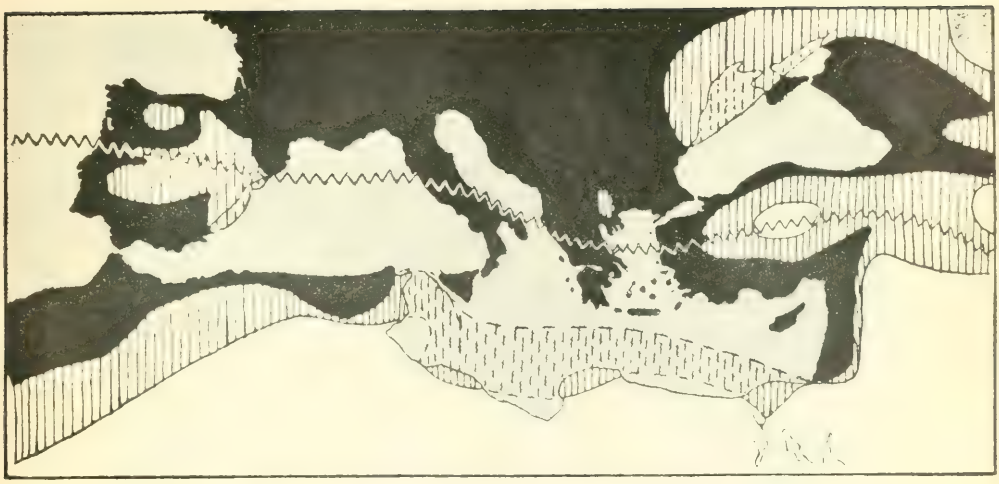

Fig. 3.—The Mean Annual Rainfall of the Mediterranean Area.

= over 20 inches of rain.
= less than 20 inches but more than 10.
= less than 10 inches of rain ; and consequently no trees or shrubs.
= northern limit of the rainless summer.

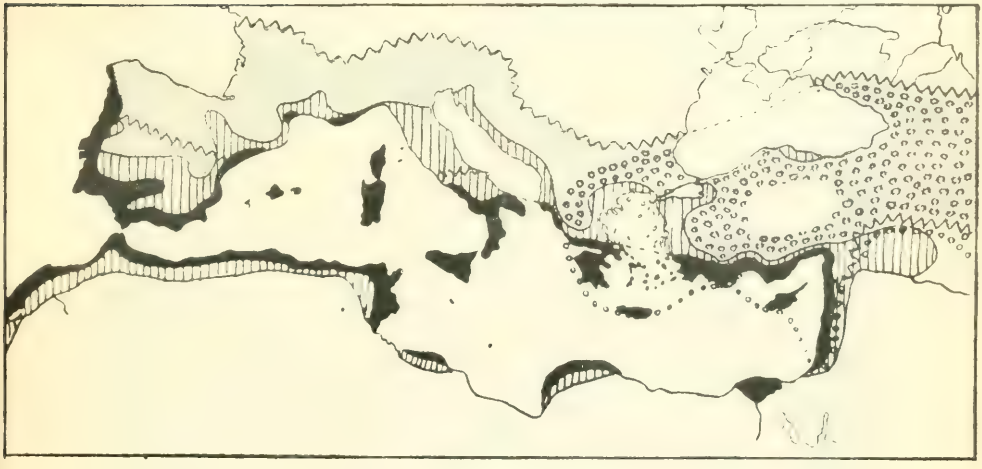

Fig. 4.—Mediterranean Vegetation.

= Orange, Lemon, and Olive.
= Olive, but not Orange nor Lemon.
o o o o = Wild Fig, but not Olive ; and southern limit of Fig.
= Spanish Chestnut, but not Olive ; and southern limit of Chestnut.

between the standard scrubland and other types of plant covering, characteristic of the grassland or of the high hills. Where rainfall is less, and summer heat longer, trees disappear; only in irrigated ground, or waterholes, olive and vine give place to fig and palm. The scrub grows more sparse, with bushes in widely open order; and eventually the evergreen scrub itself gives place to mere spring grass and annuals; and these to bare rock and blown sand, on the margins of the great deserts of the south and east. On the other hand, in upland everywhere, and generally in the rainier west, true trees increase and dominate the scrub: first dwarf-pines, then evergreen oaks, then the beginnings of meadow-grass and deciduous thickets like our northern undergrowth, with the deciduous oaks, chestnut, and walnut, all bearing edible fruits, and escorted by cherries, plums, and, in Asia Minor, even by wild apricot. Above these, again, are the pines, towards the snow-line: just as the pines replace the deciduous forests as we travel northwards across Europe or North America.

Mediterranean Men: Indigenous and Intrusive.

In a company of geographers, I need not delay to emphasise the fact that all these distributions of land and water, rainfall and temperature, plant and animal life, are not unalterable, or even stationary, but represent simply the resultant of many contending forces, and are in most cases capable of being shown to be but phases in great processes of change: of accommodation, that is, to fresh stresses in one direction or another. In the case of Man, his extraordinary powers of locomotion make the changes which he effects in his own distribution, and in that of the plants and animals which are his pensioners or his prey, so easily perceptible, that our first impulse is to place the phenomena of his distributions in a class by themselves, and contrast these processes with what we are tempted to call the "permanent environment" of wild Nature. But the distinction is of degree, not of kind; in all but the latest stages of man's co-operative effort, it is not even one of very high degree: and in the earliest stages of all, when Man himself is still in great measure "wild," it is hardly perceptible at all. In a region such as the Mediterranean, therefore, where the physical control is so strong, it need not surprise us if the main lines of human distribution follow those of the other forms of life, down almost to the dawn of written history.

The labours of a generation of anthropologists, and particularly the synthetic work of Professor Sergi of Rome, have familiarised us with the conception of a "Mediterranean" type of man, the southernmost of the great white-skinned varieties which monopolise the north-western quadrant of the Old World: less purely white-skinned, however, than either the blonde giants of the Baltic basin, or the sallow, parchment-skinned types which are distributed along the Alpine ridges and far into their northward foreland. Like the blondes of the North, Mediterranean Man, though dark in complexion and hair, is markedly oval in face and skull form: like Alpine Man, he is brunette, though he differs otherwise

Scrub, Wild Olive and remains of ancient Olive plantation. Palestine.

Scrub on margin of desert, with isolated Palm by waterside. Tripoli.

in build and proportions, and offers especial contrast in his head-form. Though he dominates the Mediterranean region, and is alone habituated fully to the Mediterranean regime of life, Mediterranean Man does not occupy the basin wholly; nor is he by any means confined to it. The Western Mediterranean indeed is his almost wholly, though the men of the mountain zone press hard upon the sea along the Riviera, and have affected very appreciably the population of all Transapennine Italy; but in the Eastern basin his hold upon the whole north shore is of the slightest. When we consider how instinctively we regard the Greeks as typical of Mediterranean humanity, this sounds at first sight almost incredible; but Von Luschan's observations in Lycia show that here, as in the Riviera, a continental type, akin to the Alpine, descends to sea-level and restricts the Mediterranean folk to the coast. The same is true of the whole eastern side of the Adriatic, and southward thence to the Gulf of Corinth; and there is growing reason to believe that the strong brachycephalic strain in the Morea, which is certainly ancient, may also be primitive there. Even in the Ægean islands, and in Crete, which were admittedly occupied early and decisively by Mediterranean Man, traces of continental intruders, of Alpine affinity, begin already at the close of the Stone Age, showing that Alpine Man was already present in force on the neighbouring mainlands. Mediterranean Man, therefore, must be regarded in all probability as an arrival from the south; and as a member of that large section of the present fauna and flora of the region, which has been, and probably still is, pushing gradually northward across this region, on the skirts of a shrinking glaciation.

It entirely accords with this view, to find that outside the Mediterranean this type of man spreads widely away in three principal directions. Southwards, with little modification, it dominated, until the arrival of the Arabs, the whole of the habitable lands of the North African level; so that our earliest historical record of Libyan Man shows him almost indistinguishable from his contemporaries "within the Great Sea." Eastward, these southern types seem to link up very closely with those of Arabia; the difference between them being rather facial than structural, just as the physical breach of continuity between Arabia and Africa is an incident, and a later incident, of their geological story. Armenoid (that is to say East-Alpine) types, however, run down the Syrian hills into south Palestine, and cut off the Arab from the Mediterranean, in a highly significant way. These southern and south-eastern extensions of our type entirely agree with our interpretation of it as of southern origin, and of its occupancy of the northern shores of the Mediterranean as recent. Thirdly, to the northwest, in proportion as the Atlantic seaboard enjoys a milder climate, and is at the same time rendered more accessible from the Mediterranean, round the flanks of the Pyrenees, Mediterranean types of Man, of the varieties popularly grouped together as Iberian, have long been propagated and established as far north as our own islands, and eastwards in early times as far as the Rhine and Upper Danube. The period of their arrival is considerably earlier apparently than that of

the westward spread of Alpine Man into Central and South-Central France, and north-westward into the fenland of the Lower Rhine. This long north-westward limb of the area of Mediterranean Man is again exactly what would occur if the main check upon his northward extension were his notorious intolerance of cold and his high mortality from diseases of the lungs.

But Mediterranean Man has no more been left in undisputed possession of his midland sea, than he has been successful, as we have seen, in annexing it wholly. He has been in occupation for a long while, it is true, for he has developed a number of highly characteristic sub-varieties, such as the dwarfed population of Sicily and Sardinia, and the bright-complexioned Greeks of the islands: but this very variety of development suggests that the experiment of acclimatisation is still in process; and, at the same time, the many mongrel forms along his northern limit, particularly in Italy, warn us that the experiment has never been undisturbed for long.

His competitors and rivals have been of two classes. The first class is of the nature of reinforcement from a kindred source; the aggression of Mauretanian peoples on Spain, which seems to have been going on almost into historic times, and permitted the vast enterprises of Carthage in the third century: and the incursions of Arabs, ancient and modern, into the Syrian coast and the Nile delta, and thence by sea to Carthage itself, and to mediæval Candia and Palermo: and by land to Gibraltar, and far away to Poitiers and Tours.

The second class consists of distinct varieties of Man: and this again is manifold. First, Alpine Man, as we have seen, appears to hold the mountain zone, perhaps not by very ancient tenure, but with extraordinarily tenacious grip: and his attack upon the lowlands (where there are any) between mountain and sea has been insidious and persistent. Next, Northern Man, in many blonde and ruddy varieties, has been active intermittently at every weak joint in the long mountain frontier towards Europe. He cannot be traced at work so early as his Alpine competitor: but his effects, when his hour came, have been incomparably greater: perhaps partly for the very reason that, in order to come at all, he has had first to force his way through the whole width of the Alpines' habitat: on which, however, he has left curiously little trace of his passage. Then, thirdly, come the aggressors from the East European grassland: and here anthropology fails us: for the grassland has supported in succession many varieties of men: its earlier populations more closely akin to those of the forests and parkland of Europe to the westward: its later settlers, mainly of eastern origin, either from the Asiatic end of the same grassland, or from the trans-Altaic reservoir of Mongoloid Man. But whichever way we turn, the situation is the same. The Mediterranean region is one of the cyclonic areas of ethnology (like Southern Africa and the North American prairie), into which, with tumultuous eddy, the human currents set, from the regions of higher Man-pressure, or of urgent centrifugal stresses.

The reasons for this indrift of man into the Mediterranean world are not easy to define; but a few main points are clear. Though the region

is not at all over-richly endowed as a whole, the oasis character of Mediterranean landscape gives it an air of exceeding wealth and comfort locally. It has its Provence, its Lombardy, its Naples and Palermo; its Saronic Gulf, its Ionia, its Crete. Up to a certain standard, life, as we have seen, is wonderfully easy there for a population commensurate with its resources; and the enormous infant mortality, which is ensured by the rainless summer and the rich fruit season, guarantees at all times that the population shall not increase too fast; and probably, under normal Mediterranean conditions—in the absence of, that is, of exceptional stimulus—that it shall hardly increase at all. Contrast with this the conditions in the European forest zone, easy enough for children, with its perennial pasture and copious milk-supply; terribly hard for adults, with poor and uncertain return for much agricultural toil, large dependence on hunting and wild fruits and so many mouths to feed. Let northern Man, under circumstances like these, once tap his mineral resources, his gold, his tin, his amber, and trade them to the southern lands, which for these things alone were "hungry"; once let commerce in minerals or forest products lead on, as it seems rapidly to have led, to wholesale traffic in the superfluous children; the result was an intercourse with the Mediterranean shores, now already rational and industrial and rich, which inevitably bred knowledge, and knowledge desire, and desire the effort to attain.

In the north, and in the forest, then, the root-trouble seems to have been that the human population tended to outgrow the natural resources of the region; at all events such resources as were accessible to northern intellects. In the east and south, and on the grassland, it was rather the natural resources which from time to time were liable to contract below the margin of subsistence for the population which was there already. It might be an accident—if it stood alone—that when Egypt, under the eighteenth Dynasty, was harassed by one wave after another of exodus from the Libyan Desert, Palestine was enduring the raids of Semitic nomads from beyond Jordan; the Ægean was in the throes of a conquest by northern invaders, comparable only with the tumults which shattered the Empire of Rome; and Italy too was experiencing that astonishing calamity which seems to have cut off the Terramare Culture of the Po valley with simultaneous fire and sword, while it left the peninsula beyond the Apennines relatively untroubled, and consequently may be assumed to have had a trans-Alpine cause. But it can hardly be an accident that on the next great occasion when Arabia emptied itself of its men, in the Saracen exodus of the seventh century, the motive power of its westward triumphs should have been so largely derived from the native nomads of Northern Sahara; or that this southern calamity, which drove the Roman name out of Africa and almost out of Spain, should have occurred in the very middle of that long period of exodus from the north-eastern grassland, which had already brought Goths into Spain, and Vandals into Roman Africa; which was making a Lombardy out of Cisalpine Gaul, repopulating Thrace and Macedonia with fresh Aryan-speaking peoples from beyond the Danube, and driving Rome, on the north also, back to the sea-line, or beyond it. When in

addition we find that the earlier Semitic exodus, of the latter part of the third millennium B.C., approximately corresponds with earlier Libyan aggression west of the Nile, and apparently also with the establishment of a new and original regime in the heart of Asia Minor—whether by way of the Dardanelles, or from the north-east we cannot say, but certainly not from the Semitic side—it almost seems as if we were confronted with some large cosmic occurrence, of which these regional migrations were merely local symptoms.

I venture to suggest that this cosmic occurrence was the periodical drying up of the great belt of grassland and desert which runs from Cape Verde to the Altai: that this desiccation forced the nomad pastoral peoples of the steppe to strike outwards towards the margins of the flat-land, and beyond them: and that the periods of quiescence which intervened were phases of more copious moisture, which permitted man and beast to multiply at home without fear.

I am somewhat encouraged in this view by the consideration that the Mediterranean itself, as we have seen, has a climate which has an annual climax of severity at midsummer, and is dependent even in the winter on local and highly accidental disturbances for its year's supply of rain. With a climate like this, a very little deviation from the average or standard certainly produces severe economic stresses, as the grim chronicle of ancient famine shows; and a secular deviation either way might well make the difference between culture and barbarism, as we apply those conceptions to the ancient history of this region. It is therefore noteworthy not only that the triumphant course of Hellenic and Græco-Roman civilisation, from the seventh century B.C., to the second century A.D., falls right in the middle of such a period of grass-land quiescence, and presumably of more than average rainfall; but also that the Minoan culture of the Ægean, and the nearly coeval developments in Italy, Sicily, Sardinia, and Spain, fall within the thousand years immediately preceding the migrations of 1500-1000 B.C.: and further, that the Renaissance, as we rightly call it, of Mediterranean prosperity in Italy, and also in many parts of the Levant, such as Cyprus, Crete, Rhodes, and the Morea, falls equally into place in the centuries which closed and succeeded the barbarian immigrations of the Middle Age. So it was probably no accident of commerce that gave to Athens Athena's gift of the olive, or organised a Scythian corn-trade, or made the great vintages of Naxos, Chios, or Falernum: any more than it was an accident which established Venetian and Genoese in a prosperous Crete or Naxos, and gave them wines of paradise like Malvoisie and Commanderia.

Looked at in this aspect, Græco-Roman civilisation seems in a surprising fashion to justify our claim that if we are to understand its meaning, we must study it in a geographical context; for, studied so, it reveals itself in a new and most intimate way as a great and successful experiment; a supreme effort to *live well* under Mediterranean conditions.

It becomes clear also, as I hinted earlier, that such an experiment, to be successful, must be made without serious disturbance: if only because disturbance under such circumstances meant disturbance of the actual

occupants of the Mediterranean by other bodies of men, less in accord with a Mediterranean environment, and, however willing, less capable of living a really good (because efficient) life in such a region. Each body of such immigrants, on the other hand, brought fresh traditional experience, and instinctive habits, to bear upon this problem of living, and consequently both started in at a fresh angle, and shaped a different career. Hellenic culture, in art or enterprise, does not repeat the performance of the Minoan Age, any more than the art and life of the Renaissance repeats that of the Great Age of Greece ; it is in proportion as we descend from the intellect and feelings to the appetites and the struggle to live, that the geographic control tightens. Man does not live by bread alone ; but in proportion as he cannot live for anything else, he becomes a part of Nature like any other animal, and his successive solutions of Nature's problems become monotonously the same.

In this discussion of the geographical foundations of Greek and Roman culture, I have intentionally begun at the beginning ; and in this brief space have only been able to go a very short distance into the subject. At first sight, indeed, I have hardly come within sight of the question which I propounded at the outset—why Greek and Roman societies assumed the peculiar institutions and mode of life which they present. But my object has been rather to suggest a point of view and a mode of treatment, than to arrive at specific results. With adequate knowledge of the land and sea and sky and plant-world of the Mediterranean, and of the larger features of its human "circulation," many answers, as I hinted at the outset, will suggest themselves. In particular, the next chapter of the inquiry becomes clear before us :—what modes of livelihood are possible for Man, on grassland, scrubland, and forest-clad country respectively ; and what stresses and redistributions will be set up inevitably, when men of different *bioi*, as Aristotle used to call them, are forced by the abrupt configuration of Ægean lands, for example, into contiguity and collision. What is the significance, for example, of the triple feud in ancient Attica between Plain and Shore and Mountain ; what motive underlies Solon's regrouping of the foreign relations of Athens, in view of his adjustment, in Attica itself, of the interests of the growers of corn and of oil ; what makes Rome similarly side uniformly in her early centuries with Lowland against Highland ; yet borrow from conquered Carthage a land system which wrecked half Italy ? These and many other cases of abrupt or gradual accommodation of Man's career to the large facts of his Mediterranean environment clearly need treating as such ; and when treated so, begin to give rich returns. And they give them, as I know well, not only in the upper levels of advanced study, but in living interest and stimulus among absolute beginners.

To learn to see the Mediterranean world, in its intimate relation to our own, but yet as Greek and Roman knew it ;—with its "two voices" of Mountain and Sea ; with its simple annual sequence of "winter and summer" ; its oasis fertility (Pan, Artemis, and the Nymphs, encircling at ease the "Works and Days" of laborious Man) ; and with its minute foci of oasis cultures, ever finding fresh friend or foe beyond the next pass and promontory—is to see a real world, and a living world ; and, learning it so, we must needs learn to learn more.

Dr. SVEN HEDIN IN TIBET: A Review.[1]

(With Illustrations.)

In the course of the past year we have had a great number of books dealing with exploration in various parts of the world, and now we have these two handsome and beautifully illustrated volumes by Dr. Sven Hedin, or rather as we must now style him Sir Sven Hedin, K.C.I.E. He is, of course, no stranger to the Royal Scottish Geographical Society, where he always receives an enthusiastic welcome, and never more enthusiastic than in February last year, when he was good enough to give us a lecture on his expedition in the years 1906-8, through the tract of Tibet which he has named Trans-Himalaya. In this lecture, which was published in the April number of the Magazine, he gave us an outline of the course and of the results of the expedition; in these volumes we have the detailed story, but even this is incomplete, and we are promised, in the preface, a third volume, the manuscript of which is already finished. Besides this, the distinguished traveller promises a special work for the benefit of young people, eager for adventures. He may depend upon it that both of these volumes will meet with an enthusiastic welcome. We may remark in passing, that the appearance of the present two volumes represents an extraordinary feat in composition. Between them they contain 859 pages of letter-press, all of which were composed in a period of 107 days, while the author was busily engaged with a mass of other work. He describes it as a "book from beginning to end like a vessel which ventures out into the ocean of the world's tumult and of criticism with many leaks and cracks." But the reader will be the last person to notice either one or other.

As our readers presumably heard the lecture in February 1909, or read it in the April number of the Magazine of that year, it is unnecessary to repeat what is already easily available to them regarding the course of the expedition. Sir Sven left Stockholm in October 1905 on this, his fifth expedition to Tibet in twenty-one years. He travelled overland through Constantinople, Turkish Armenia, Persia and India, and arrived at Simla in May 1906, where he was personally welcomed by the authorities, but soon ascertained that neither the Indian nor the Home Government would in any way authorise or assist him in his project. To a man of his temperament an obstacle of this sort merely added a stimulus and zest to his determination, so he proceeded to Srinagar in Cashmere and thence to Leh, where he made up his caravan and prepared to invade the Forbidden Land. Up to this time his difficulties had been serious and many. This is how he enumerates them: "I had had to fight my way through a long succession of

[1] *Trans-Himalaya: Discoveries and Adventures in Tibet*, by Sven Hedin, Macmillan and Co., Ltd., London, 1909. Price 30s.

We are indebted to the publishers for permission to reproduce the two accompanying illustrations.—Ed. *S.G.M.*

difficulties and hindrances before reaching this day (*i.e.* the day of departure). Batum was in open insurrection: in Asia Minor Sultan Abdul Hamid had provided me with a guard of six mounted men to protect me from robbers: in Teheran revolutionary tendencies were even then apparent: in Seistan the plague was raging fearfully; and in India I encountered the worst obstacle of all—an absolute prohibition to proceed into Tibet from that side. Then followed all the unnecessary complications in Srinagar and on the way to Leh, and the stupid affair of the Chinese passport which I did not need, but had so much trouble to obtain. Does not this remind one of the tale of the knight who had to overcome a lot of hideous monsters and hindrances before he reached the princess on the summit of the crystal mountain?" It was in August 1906 that he disappeared into Tibet, and he emerged two years later, *i.e.* in September 1908. His intention was to avoid as much as possible the routes and places which had been already explored and reported on by his predecessors, the famous Indian surveyors Nain Singh and A. K. (Krishna), and Europeans like Deasy, Rawling, Wellby, Dutreuil de Rhins, Calvert, Littledale, and others. But in his wanderings he had to cross their tracks repeatedly, and on one occasion he halted at a former camp of Deasy's which three years before had been ransacked by Rawling, who had, however, left some boxes of American meat, ropes, and a packet of blotting paper, all of which he appropriated. It was near this camp that Sir Sven had an adventure which might have brought the expedition to a sudden and disastrous conclusion. He was sailing on the Yeshil-Kul lake for the purpose of taking soundings when a storm arose, and he and his companions made for the shore. On nearing it they found waiting for them two lean and hungry wolves, which might have been the scouts of a troop. They were unarmed, so there was nothing for it but to turn the boat, face the storm, and make for another landing place, which they reached with much difficulty and spent a miserable night, shivering with fear, cold, and hunger.

In perusing this book the reader cannot fail to be impressed by the courage and audacity of the writer, who, happily for himself, is endowed with a most powerful physique. From the very start at Leh he knew that he and his comrades were certain to have to endure all sorts of hardships from cold and bad weather and bad roads, want of food and water, possibly also from robbers and from the authorities when his presence in the camp was discovered, and discovery was a mere question of time. Indeed if there is any feature in the narrative of the journey in the book the repetition of which becomes almost monotonous, it is the mention of the dreadful storms which they encountered everywhere,—one chapter bears the ominous title of "Thirty days of Storm,"—and it must be remembered that these storms came upon them often when they were 16,000 or 18,000 feet above the level of the sea. Cold and hunger also must have tested and strained the vital powers of the members of the expedition to an extraordinary degree: they proved deadly to the animals, for ere the expedition was over all the horses and mules had succumbed. Indeed it is somewhat sad reading from day to day that "two horses died on the way," or "a mule was found dead."

At camp 304 "the thermometer fell to −39·6 , or to nearly 40° below zero, and almost to the freezing point of mercury. That was the lowest temperature I ever recorded in all my journeys in Asia." At one stage of their journey they spent seventy nine days, and at another sixty-four days, without coming across any of the inhabitants of the country.

When they did reach the tents of the nomads who inhabit the outskirts of civilised Tibet, the principal difficulty was to conceal their movements from the authorities, who had peremptory orders from Lhasa and Pekin to send them back by the route by which they had come. The story of how they evaded this catastrophe and reached the holy city of Shigatse is amusing and interesting, but we must refer our readers to the account of it in the first volume. At Shigatse they remained from the 9th February to the 27th March, and witnessed the religious fêtes and games by which the Buddhist new year is inaugurated. On the 12th February Sir Sven had an interview with the Tashi Lama. Our readers may recollect, that in reviewing the *Three Years in Tibet* by the Japanese Lama Ekai Kawaguchi (p. 48) we stated, that in his many interviews with the Dalai Lama at Lhasa he found him much more immersed and interested in politics than in religion. The Tashi Lama (p. 134) at Shigatse is, however, Sir Sven Hedin says, the holiest man in Tibet. But it may be as well to quote *in extenso* Sir Sven's description of the Buddhist Pope and his surroundings. "The Tashi Lama is sitting on a bench in a window recess, and has in front of him a small table with a teacup, a telescope, and some printed sheets. He is dressed as simply as an ordinary monk, wears a cerise costume of the usual style, coat, waistcoat, vest, and the long scarf which is thrown over the shoulder and wound round the body like a toga; between its folds peeps out a yellow undervest with gold embroidery; both arms are bare and the head is uncovered. His complexion is fair, slightly inclining to yellow; he is somewhat below the middle height, is well proportioned, looks healthy, and at his twenty-fifth year, lately completed, has every prospect of attaining a good old age. In his small, soft, delicate hands he holds a rosary of red beads. His short-cropped hair is black, and there is scarcely any down on his upper lip: his lips are not thick and full like those of other Tibetans, but thin and gracefully formed, and his eyes are of a chestnut-brown colour.

"Nodding kindly, he gives me both his hands and invites me to sit in an arm-chair beside him. The apartment, in which he spends the greater part of the day, is astonishingly plain, quite a contrast to that of the cardinal in the lower regions. It is small and consists of two parts; the outer is a kind of roofless anteroom, exposed to all the winds of heaven, to the snow in winter and the pouring rain in autumn; the inner is raised a step, and is again separated by a division ending in a grille, behind which his bedroom is situated. There is not a single idol, no wall-painting or other mural decoration, no furniture except what has been already mentioned, not a thread of carpet, only the bare stone floor—and through the window his melancholy and dreamy, but clear and open, glances wander over the golden temple-roofs, over the town below them with its dirt and sinfulness, over the dreary mountains which bound his earthly

horizon, and away through the azure-blue sky to a Nirvana invisible to us, where his spirit will one day find rest. Now he descended from his

The Tashi Lama.

heaven and became a man for a moment. But all the time he preserved a wonderful calmness, a refined, amiable politeness and dignity, and spoke in a charmingly soft and subdued voice, modest, almost shy; he

spoke quickly and in short sentences, but in a very low tone. What did we talk about? Why, about all kinds of things in heaven and earth, beginning with his own religion, in the Pantheon of which he himself takes the highest rank among living prelates, down to the yaks that roam wild over Chang-tang. He displayed an alertness, an interest in everything, and an intelligence that surprised me in a Tibetan. I have never been interviewed so thoroughly and with so much tact." The interview lasted three hours, during which Sir Sven received *carte-blanche* to go where he pleased and do what he liked, and he got promises of a passport for future journeys in the country and for an efficient escort. "All these promises were fulfilled to the smallest detail, and if China had not just at this time seized Tibet more tightly than ever in its dragon's claws, the Tashi Lama would certainly have been powerful enough to throw every door open to me. But at any rate his friendship and favour were an excellent recommendation in all my subsequent journeys, and extricated me from many a difficult situation." Sir Sven sums up his impressions of the potentate in these words: "Wonderful! never-to-be-forgotten Tashi Lama! Never has any man made so deep and ineffaceable impression on me. Not as a divinity in human form, but as a man, who in goodness of heart, innocence, and purity approaches as near as possible to perfection. I shall never forget his expression; it displayed unbounded kindness, humility, and philanthropy: and I have never seen such a smile, a mouth so delicately formed, so noble a countenance."

Sir Sven made the best use of the Tashi Lama's permission, and saw everything that was to be seen in and around Shigatse, and the chapters in which he describes what he saw are among the most interesting in the book. But his arrival at Shigatse had occasioned no small disturbance in the political world, and notes and telegrams were flying between Lhasa, Gyantse, Shigatse, Pekin, Calcutta, and London, the main object of which was to induce him to march straight to Sikkim in British India. But as this would have been the end of the expedition, it was the very last thing to which Sir Sven would agree, so skilfully pleading danger to the health of the other members of the party if they went to India, he induced the authorities to permit him to proceed to the north side of the Tsang-po. On the 27th March 1907 the expedition started off into the valley of the Tsang-po, and in the middle of April reached the monastery of Linga, where Sir Sven saw the outside of a cave, immured in which a hermit had elected to spend his life. The hermit, then in the cave, had been there for three years; one predecessor had been in for twelve years, and one for forty. The cave "is built over a spring which bubbles up in the centre of a single room, a square apartment with each side five paces long. The walls are very thick, and are in one solid mass, unbroken by windows. The doorway is very low, and the wooden door is shut and locked; but that is not enough, so a wall of large blocks and smaller stones has been built before the door, and even the smallest interstices between them have been carefully filled up with pebbles. Not an inch of the door can be seen. But inside the entrance is a tiny tunnel through which the hermit's food can be pushed in. The amount of daylight

which can penetrate through the long narrow loophole must be very small; and it does not shine in direct, for the front of the hut is shut in by a wall, forming a small court, which only the monk who brings the anchorite his daily ration may enter. A small chimney arises from the flat roof, for the hermit may make himself tea every sixth day, and for this purpose some sticks of firewood are pushed through the loop-hole twice in the month. Through the chimney, too, a feeble light may fall, and by means of these two vents the air is renewed in the cell."

The expedition passed on over the Chang-la-Pod-la Pass, 18,284 feet above sea-level, to Saka-dsong, where a grievous misfortune befell it in the death of the leader of the caravan, Mahommed Isa, to whom Major Rawling paid a graceful tribute at the meeting of the Geographical Society in April 1909, and of whom Sir Sven writes: "During all my journeys I had never had a more efficient, experienced, and faithful caravan leader: he had maintained discipline in the caravan, been a father to the men, and taken the best care of the animals: he had been an excellent interpreter, and had treated the natives with prudence and tact. By his happy humorous disposition he had kept all the others in good temper. In difficult situations he had always found the right way out. In unknown country he had climbed passes and summits to look for the best route—he had always gone himself, and had not sent others. His memory would always be cherished among us, and he had also earned a great name in the exploration of Asia, for during thirty years he had served many other Sahibs as faithfully and honestly as myself."

Considerations of space prohibit us from dealing with what are perhaps the most important matters in these volumes, *i.e.* the explorations which resulted in Sir Sven's discovery of the sources of the three great rivers, the Brahmaputra, the Sutlej, and the Indus. For the same reason we must pass by his interesting account of the surroundings of the holy lake Manasarovar, and the twenty-eight miles circumambit of the Mountain of Salvation, Kailas, reputed to be the centre of the world, where Sir Sven, himself in pilgrim garb, walked among crowds of devotees "a silent procession, the faithful bands, among which all ages and both sexes are represented, youths and maidens, strong men with wife and child, grey old men who would before their death follow in the foot-steps of countless pilgrims to win a happier existence, ragged fellows who lived like parasites on the charity of the other pilgrims, scoundrels who had to do penance for a crime, robbers who had plundered peaceful travellers, chiefs, officials, herdsmen, and nomads, a varied train of shady humanity on the thorny road, which after interminable ages ends in the deep peace of Nirvana."

The expedition marched on to Gartok in Western Tibet, and there Sir Sven, with characteristic courage, formed a resolution which he may be allowed to state in his own words: "Besides many other problems that had been solved, I had crossed the Trans-Himalaya by five passes, namely, the Sela-la, Chang-la-Pod-la, Angden-la, Tseti-lachen-la, and Jukti-la, of which the first four had been entirely unknown. But between the Angden-la and the Tseti-lachen-la, I had been obliged to leave a gap of quite 330 miles in the exploration of the Trans-

Himalaya. Of this region nothing was known but the summits Ryder had seen from his route, and which he and Wood had measured by observation. We also possessed some uncertain statements of Nain Singh's journey in 1873, but his route lay to the north of the blank patch, and this blank patch represented an area of 5300 square miles. I could not return home without having done all that was humanly possible to traverse the unknown country by at least one route. Precisely there was the watershed between the Indian Ocean and the inland drainage of the salt lakes on the Tibetan plateau. There many lakes and rivers might be expected to exist, and there lay the great province of Bongba, of which so many hazy reports had reached our ears from its northern, eastern, and southern boundaries. But the greatest and most important question of all was: Does the Nien-chen-tang-la run right through Tibet in a westerly and north-westerly direction to the north of the Tsangpo and the Upper Indus? No European and no pandit had hitherto ventured on this problem. . . . I knew that if I did not succeed now in penetrating into the country which, on the latest English map of Tibet (1906, Map 1), bears only the word 'Unexplored,' one fine day another explorer would come and rob me of this triumph. And this thought I could not endure." The Gartok authorities took good care that he should not go by the direct route, so he had to arrange for a fresh caravan from Leh, which he joined at Drugub in the end of November 1907. This second journey across Tibet proved to be the hardest that Sir Sven has ever made owing to the severity of the weather, bad roads, loss of animals, and want of food and water. For the details of it we must refer our readers to the second volume of this book. It was not till well on in February 1908 that they came across some nomads, and then the utmost care had to be taken lest the presence of an European in the camp should be detected. Disguised as a dirty Ladakhi Sir Sven used to drive the sheep when the party were in the vicinity of tents, and he kept himself out of sight in a tent as much as possible at all times. No wonder that he says of his life at this juncture, "nothing is so trying and irritating to the mind as this anxiety in which I lived, travelling in disguise, and expecting any moment to come to a crisis in my fate." By crossing the Samye-la pass at a height of 18,133 feet, Sir Sven succeeded in crossing "Trans-Himalaya between the Tseti lachen-la and the Angden-la, and gaining another point on the immense boundary line on the north of the basins of the great Indian rivers, and I succeeded in proving the unbroken continuance of the Trans-Himalaya for 118 miles west of Angden-la. A most extraordinarily interesting discovery also was that the Angden-la and the Samye-la, though exactly the same value as water-sheds, do not lie on the same chain." When they were two days' march from Ragatasam the expected crisis arrived in the shape of a party of soldiers, who announced that every man of the expedition was to be searched to the skin to see whether or not he was an European. The game was up, and Sir Sven disclosed himself to the leader of the soldiers, who turned out to be an old friend of his. It is not surprising that by this time Sir Sven had had enough of exploration,

at least for a time, and his only wish was to get back to India as soon

Dr. Sven Hedin disguised as a shepherd.

as possible, but this did not prevent the spirit of exploration from prompting him to insist on getting there by a route hitherto unexplored.

As usual, by a judicious mixture of firmness, bluff, and cajolery, he succeeded in overcoming official opposition and getting his way, and this led him over the Sangmo-bertik-la, a pass of 19,094 feet on the main crest of Trans-Himalaya. Farther on he came to the Heavenly Lake, Teri-nam-tso, 15,367 feet above sea-level, the shores of which had never been trodden by an European before. The expedition went on its way over such high passes as the Lunkar-la, 18,276 feet, the Sur-la-Kemi-la, 19,134 feet, and the Ding-la, 19,308 feet above sea-level, the last mentioned being the highest pass crossed over by the expedition. It was delayed some days at Tokchen and then resumed its march towards India. On the 13th August 1908 Sir Sven received his first news of the outer world from a Hindu doctor, and on the 15th September he arrived at Simla, where he received from all the hearty welcome he deserved.

Sir Sven Hedin has himself modestly summed up the results of this memorable expedition in a telegram to the *Times*, in which he says: "My great discoveries are, first, the true sources of the Brahmaputra and Indus, and the genetic source of the Sutlej east of Manasarovar Lake; secondly, the exploration of Bongba, which I traversed twice by different routes. But the greatest of all is the discovery of that continuous mountain chain which, taken as a whole, is the most massive range on the crust of the Earth, its average height above the sea-level being greater than that of the Himalayas. The peaks are 4000 to 5000 feet lower than Mount Everest, but its passes average 3000 feet higher than the Himalayan passes. The eastern and western parts were known before, but the central and highest part is in Bongba, which was previously unexplored." Geographers and scientists, however, will do well to postpone a final judgment on the extent and value of his work, until they have before them the final maps and another "voluminous scientific work which will be distinguished by still greater accuracy and detail."

Any one who reads this fascinating story cannot fail to notice that the key to its interest and charm lies, not only, nor even for the most part, in the novelty of the geographical discoveries, or in the thrilling adventures and incidents, or in the simplicity and directness of the style, or in the transparent truthfulness of the narrative, but it is to be found in the personality of the writer. Here we have a man, who, although he might have elected to rest on his well-earned laurels as an explorer and geographer of the first rank, deliberately, for the sake of adding to our knowledge of the geography of one of the most difficult and dangerous tracts in the world, makes his plans for a prolonged expedition, although he knew from former experience and from present circumstances that he would be strenuously opposed everywhere by the local authorities, and that he had nothing to expect in the way of support from outside rulers. He knew also that he would encounter very grave dangers from storms, cold, robbers, hunger and thirst, and possibly from fanatics, and that he would have to entrust his life to a number of half-civilised persons, most of whom had never seen him before, and whose reputation for honesty and truthfulness is not very high; and he knew he would have to require these men to share the dangers and perils which awaited himself. For

the leadership of such an expedition much more was required than the highest attainments in scientific geography, splendid physique, and indomitable courage. To these indispensable qualifications he had to add the power of inspiring trust and confidence wherever he went, of winning respect and affection from all classes of society, and of presenting himself in such a light that resentment, whether religious or political, would be at once disarmed. That Sir Sven Hedin has an unlimited command of this power is conspicuous throughout the story. Nobody was ever angry with him. The monks of the Tugugompa monastery burned incense before the images of the lake-god, and prayed for his safety when they saw him in danger of death by drowning while engaged in sounding the holy lake Manasarovar, a profane task, which they believed had called down on him the anger of the god. At Shigatse, he mentions incidentally, "a man and a woman lived in a wretched hut in the entrance gate, and procured for us anything we wanted. The woman was old and infirm, and her face was bedaubed with black, but she was exceedingly friendly. She was always coming to my tent, bowing, giggling, and grinning out of pure goodwill." During the most wearisome and dangerous parts of their wanderings his followers never complained; and they wept like children when the inevitable hour of separation from him came. Both the Chinese and Tibetan authorities were studiously courteous and considerate to him, even when he was caught red-hand in evading or violating their orders. In their hearts they must have sincerely admired him, although aware that he was a nuisance, and sometimes a danger to them. The secret of this power seems to us to have been, not his courage or his diplomacy, but his personal sympathy and kind-heartedness for all those with whom he came in contact. No one knew better the defects of their character and their limitations, but this did not affect his treatment of them, which was invariably generous, courteous, and kind. Nor was this kindness and consideration confined to human beings; it extended to the horses, mules, yaks, and dogs in the camp. In these days of religious intoleration and narrowness Sir Sven presents a bright example of broad-minded charity. He sees what we can reverence in both Buddhism and Islam, and observes that "we, who in our superior wisdom smile at these exhibitions of fanaticism and self-mortification, ought to compare our own faith and convictions with theirs. The life beyond the grave is hidden from all peoples, but religious conceptions have clothed it in different forms among different peoples. 'If thou lookest closely, thou wilt see that hope, the child of heaven, points every mortal with trembling hands to the obscure heights.' Whatever may be our own convictions we must admire those who, however erroneous their views may be in our opinion, yet possess faith enough to remove mountains."

We must add to this that he shows himself possessed of a delightful sense of humour, and a hopefulness and buoyancy of spirits which rarely or never failed him. There is no trace of malice or rancour against those who opposed or thwarted his plans, for he understands and appreciates how his actions must have appeared to them. In claiming recognition of his own discoveries he is generous to his many illustrious predecessors, Indians and Europeans, and while correcting their errors,

he makes every allowance for the difficulties under which they accomplished much good solid work. The book is equipped with several excellent maps, and it is abundantly illustrated with photographs and sketches, several of them in colours. The last dozen chapters show evidence of haste—indeed Sir Sven tells us that his publisher was impatient—but we have no hesitation in commending this work to our readers as second to none of the many books of adventure and exploration which have appeared within the last score of years.

TAVERNIER'S TRAVELS IN MESOPOTAMIA.

By R. Campbell Thompson, M.A., F.R.G.S.

(With Illustrations.)

"Mon age ne me permettant plus d'entreprendre de nouveaux voyages, j'ai eu une espèce de honte de me voir inutile à mon pays, et de ne m'acquiter pas de tout ce qu'il attendoit de moi. J'ai cru lui devoir rendre compte de mes observations sur ce que j'ai vu." Thus speaks that traveller and gentleman of parts, Jean Baptiste Tavernier, Chevalier Baron d'Aubonne, in the preface to the story of his six journeys through Turkey, Persia, and the Indies, in the seventeenth century, and it is of his impressions of Mesopotamia and the country through which the Baghdad railway may pass that we would speak. Like Sinbad, Tavernier was never immune from that road-fever which the chance sight of wharf-ingers loading caiques with mysterious bales always set up in him. Peer to Raphael Hythloday, and brother in the restless guild of which Cain is the father, he threaded the maze of Arab camel-paths with a clue of sixty thousand leagues' length, in order that, as his stately dedication to his king declares in courtier language, he might spread abroad the fame of his majesty's heroic qualities.

In his six journeys the Baron traversed most of the routes of Mesopotamia which were open to a European. In the first he went to Ispahan from Constantinople by Erzerum and Kars; in the next three, begun in 1638 (and it is with these that we are most concerned) he left his ship at Alexandretta and proceeded into Persia by a different way each time; and in the last two he made Smyrna his starting-point.

"It is but three short days' horse-ride from Alexandretta to Aleppo, and some who have been well-mounted have done it in two." This description is accurate, for nowadays a four-horsed carriage will cover the distance in two days, up the steeps of Pylae and across the flat, rolling downs beyond the great sea-chain of mountains. *Belan*, the Pylae of Xenophon, is, as Tavernier says, a high mountain down which the wind sweeps so fiercely as to bear hazard to the ships which lie at anchor in the distant bay. Perched on this eyrie, amid steep rocks and red umber earth reminiscent of the good West Countree, is the little

village of Belan, of wooden houses in successive tiers. There was a curious story current at this time that no Franks were allowed to pass on foot from Alexandretta to Aleppo, owing to certain sailors who had made a common treasury of their savings of a hundred crowns or more, and set out to walk from the seaport to trade with this capital. They covered the distance to Aleppo easily in three days, spending but little on the way, and as their expenses were small, they did not trouble themselves to obtain more than four or five per cent. on their wares when they again reached Alexandretta. This entirely upset the market, and therefore the Aleppo merchants, greedy of larger profits, secured a ruling that no Europeans should henceforth travel except by horse at an expense of six piastres for each beast each way.

What struck the Baron most in the plain of Antioch was the quantity of olive-trees, and he mentions that soap made therefrom is one of the most agreeable gifts which can be made to the Arabs. They will gladly accept the oil to anoint head, face, and beard, crying as they do so, *God be thanked*. Hereabouts he found a pool containing a kind of barbel: "j'en tuay un avec mon fusil et le trouvay de bon goust." Thence he proceeded to Aleppo, of which he gives a long description; but although he admits a certain beauty in six or seven of the mosque-domes which rise above the houses, he will not grant that either public or private buildings are fair to look upon except from within. A later traveller, George Smith, Orientalist and excavator, who passed through in the seventies, and died and was buried there on his return journey from digging in the ruins of Nineveh, says that the houses are very fair for an Eastern town. Yet nowadays if a man has seen the pink lights of an Aleppo sunset after rain cast upon the creamy stone of the walls, silhouetting the fretted woodwork of the overhanging lattices, he will in no wise agree with the Frenchman, or the unknown traveller from Aleppo to Alexandretta whose scribbling on the walls of one of the khans bears witness to-day to his opinion: "Après avoir passé quelque temps dans la ville d'Aleppe, je ne suis pas content . . . malgré les attentions d'une de ses habitants du beau sexe."

Tavernier's second journey was the most interesting, for then he passed what he calls the Great Desert to Basra. This is an unusual route at all times, and was only followed by Turkish and Egyptian merchants once a year after the rains when they wished to buy camels. Forced on this occasion to wait seven weeks in Aleppo for such a caravan, Tavernier busied himself with laying in a viaticum of rice, butter, cheese, almonds, nuts, figs, caviare, and all such foods as would last the journey, especially beef-tongues, and sausages, which he says must be eaten in secret because of the risk of suffering indignities from the Turks to whom the pig is forbidden. Indeed, he seems often to have had little sympathy with the customs of the countries in which he travelled, and once he boasts of having cozened certain Turks near Ephesus, who seemed anxious to pick a quarrel with him. He and his companions were lunching in a mosque with a skin of wine and another of water, and on seeing the approach of these Mohammedans, "knowing the country

better than any of the company" he hastily smuggled the forbidden drink out of sight. "*Dogs,* said they, *you are drinking wine. No,* answered I at once, speaking on behalf of the others as I knew a little of the language, *we are not* (for I had had it hidden), *we are drinking nothing but water; will you taste it?*" Then he winked at one of the Turks who was not slow to understand that something was afoot, and though the Frenchman's party was haled before the Cadi, the evidence was completely in their favour. "As a matter of fact," says Tavernier, "I had slipped eight ducats into the hand of the Turk to whom I had winked, and he was so delighted with a present so far in excess of his

An Island in the Euphrates.

expectations that he had seen to it that his fellows said nothing to our disadvantage."

His caravan started from Aleppo on Christmas Day towards Anah on the Euphrates, and he declares that they found water every two or three days only, for the first fifteen days of the march. On the twentieth day they were warned by a messenger coming westwards bearing news of the capture of Baghdad, that the weary and lame camels of the Grand Seigneur and his suite were following behind him, and so Tavernier's *caravan bashi* would be well advised to avoid Anah, lest his fresh beasts be requisitioned. So they folded their tents and moved off at three o'clock in the morning directly southwards, and a week later encountered a party of thirty well-mounted Arabs, probably Aneyzeh nomads, who rode up just as they were leaving a small settlement with three wells. The presents offered to the Emir of this band,

a piece of satin, a piece of scarlet cloth, and two large copper caldrons, were not considered enough, and the travellers, to their disgust, were mulcted of four hundred crowns which they paid after a week's discussion. Anah, the small town which they avoided, is to-day spread over a mile or so of the Euphrates' bank, and Tavernier who visited it on another journey, describes it as being of mediocre size, belonging to an Arab Emir, and resembling Paris, "for it is built on both sides of the Euphrates, and in the midst of the river there is an island on which is a fine mosque." In striking southwards and leaving Anah on their left hand they must have made a wide detour into the Syrian desert, for they did not touch the Euphrates again until after Nejef (Meshed Ali), the ancient Kufa, was passed. Thence Tavernier went to Basra, completing a most unusual journey across the unfrequented ways of this country. He must have covered much of the same ground as did Colonel Chesney on his return journey from Basra some sixty years ago. The usual route is to keep as near the water as possible.

In 1643 he again set out from Paris, and this time, before ever he reached Alexandretta, his ship, mounting thirty-five guns, was pursued by a corsair of superior metal off Candia. All one night the chase had continued, but the wind being favourable they had kept their distance. But by morning the wind had dropped, and the corsair lowered two boats full of ruffians armed to the teeth to essay a capture, which Tavernier's ship did its best to escape by using the jolly-boat to tow their heavy vessel, as well as by plying the sweeps manfully on board the ship itself. In spite of this the enemy gained rapidly on them until they came within range of their carronades, and then they dared not come further. Meanwhile the ship had been put in a state of defence, red cloth being rigged in the place of boarding nettings, and each man bringing up his mattress as a screen to protect him at his post: and the corsairs' ship, seeing that boarding was an impossible feat, fired four or five broadsides which hissed harmlessly overhead. Tavernier's gunner retaliated by knocking away the enemy's foremast and pitching several round shot into the forecastle, with deadly effect. At this moment their look-out spied a sail to southwards, which the pirates also sighted, and having no more stomach for fighting a pestilent enemy who could give such hard knocks, the corsairs went about in search of fresh prey. "This," says Tavernier (one had almost called him fire-eater, save that he takes everything that befalls him as a matter of course) "was our only adventure," and they arrived happily at Alexandretta. He proceeded to Aleppo by the same route as before, and thence, starting with two Capuchin fathers, set out for Biredjik, which he calls Bir or Berygeon, making the journey in four days. This is the point at which the Baghdad railway is expected to cross the Euphrates, passing thence a dozen miles to the south of Urfa and going almost directly to Nisibin. The Baron describes it as situated on the slope of a mountain and protected by a tower with eight or nine wretched culverins, and a governor's guard of two hundred Janissaries and four hundred Spahis. From here he moved on to Charmelik (he calls it Charmely) near which was a fortress garrisoned by two hundred Spahis to defend the neighbourhood against the incursions of roving

Arabs It had been founded by a grand vizier on his return from a disastrous expedition against Baghdad in which he had lost a great part of the Grand Seigneur's army, and consequently feared to return to Constantinople. Believing himself to be popular with his troops he made up his mind to establish a retreat for himself on the hill close to Charmelik, until the storm which he reasonably expected had blown over. Had he succeeded in finishing his fortress he could have made himself overlord of Mesopotamia, for all routes to Aleppo, whether from Tebriz, Mosul, or Baghdad, would have come within his grip; but by the machinations of the Sultan his own followers strangled him just when his work was nearing completion.

Of Urfa Tavernier has all the stories of Abraham and Abgar, the

A street in Mosul.

two names for which the ancient city of Edessa is famous. Cuneiform decipherment, however, has robbed it of its greater hero, whose home, Ur of the Chaldees, has long since been identified with the mounds of Mukeyyer in Babylonia, but the Syriac stories of Addai and King Abagarus still admit of credence in the lesser. According to our author the number of available troops was about seven hundred and fifty cavalry and infantry, and it is quite clear from what he says that Arab razzias were by no means uncommon.

He continued his route by Mardin and Nisibin to Mosul, of which he speaks in unnecessarily contemptuous tones, saying that there is nothing curious to see there, and that the chief interest is in the merchants, especially the Arabs and Kurds who inhabit Kurdistan, from where comes a goodly wheat harvest and great store of gall-nuts. In his adverse criticism

he shows how much keener he is for the more material advantages than for the æsthetic side of travel, for Mosul has a peculiar charm of its own, and it is unjust to describe it with such depreciation because it is not a tourist's curiosity-shop. Yet it may be that the other towns which the Baron visited were far less tainted with Western civilisation than they are now, and Mosul, still unspoilt and picturesque, with its houses built of marble with overhanging eaves, was less remarkable then than it is to-day. His comments on the difference between the Euphrates and the Tigris are apt—"the water of the Euphrates appeared to me ruddy and less rapid than that of the Tigris, which seems to be whitish like the Loire"—for the Euphrates is a slow-flowing stream, often muddy and opaque, which eddies in sluggish curls between high banks; while the Tigris, fed by tributaries from the limestone hills of the Persian highlands, runs much clearer except in the spring freshets. The bridge of boats at Mosul was in existence even in Tavernier's time, for he mentions crossing it when he went to see the ruins of Nineveh on the other side of the Tigris.

It cannot be said that his description of the ruins of Nineveh holds good for what is visible nowadays. "*Ninive*, which was built on the left bank of the Tigris, is at present only a confusion of old ruins (*masures*), which extend for about a league along the river. There are many vaults or caverns, although one cannot judge whether these used to serve as a dwelling-place for the inhabitants or if there was something more above, for the majority of Turkish villages are as if they were sunk in the earth, or hardly reach two stories. Half a league from the Tigris there is a little hill surrounded by several houses with a fairly good mosque on the top. Here local tradition says that the Prophet Jonah was buried, and the place is held in such veneration that no Christian may enter except by stealth, and then only by particular favour and paying his way. This was the manner in which I entered with the two Capuchin fathers, but we had to wait for nightfall and to take off our shoes according to custom." Now he makes no mention of the larger mound of Kouyunjik, three-quarters of a mile long and only half a mile from the mound of Nebi Yunus which he describes, nor of the great encircling walls (unless these be the *masures*), which will take a man nearly an hour to ride round on a good horse; and it is difficult to identify the vaults or caverns of which he speaks. Certainly there are none now within the enceinte, which is all plough land or *tel*; and as the Tigris has been known to reach the very walls in time of spate, flooding the banks at the mouth of the Khosr, the *hawiga* copses full of francolin, and the marshes where the snipe lie in winter, it is strange to think of this as an inhabited part of Nineveh. But it is true that Nebi Yunus is held in high reverence, and the present writer was permitted to enter only after ablution and under the conditions mentioned by Tavernier, save that it was in broad daylight and there was no secret about it.

After a sojourn of eight or ten days he was glad enough to leave Mosul, moving eastwards by the plains of Arbela to the Persian frontier, whence he continued his journey to Ispahan. It was not

until his fourth journey in 1651-52 that he went down the Tigris route from Mosul in a raft. This was the *kelek*, which he persists in calling *kilet* (he does not seem to have distinguished the final *k* in the native pronunciation), which the inhabitants have used from Assyrian times down to the present day. The Baron describes one used for a ferry on the Bohrus (and the description holds good for those made to-day): "They bind long poles together, five or six one on top of the other, like a floating raft of wood, and this is called in the language of the country *Kilet*. They are made square, and underneath are placed about a hundred goat-skins filled with air. . . . The merchant must be at pains to spread some thick felt mats above, that the water may not

The eastern wall of Nineveh and the River Khosr.

penetrate and soak his goods." The *keleks* used in floating down the Tigris are, as he says, much larger.

His raft took six days to reach Tekrit—a long time, especially in February when the river was probably high, unless the winds were contrary, and two days later he was at Samara, of which he remarks that many Mohammedans, especially Indians and Tartars, go to worship there because forty of their prophets are buried there. Yet he does not mention the golden dome of the mosque which is the first thing to catch the traveller's eye with its noose of light. Finally on the eleventh day he arrived at Baghdad, which he considers synonymous with Babylon, and he gives an account of *Agarkuf*, "which the vulgar believe to be the remains of the Tower of Babel." But he scorns such a belief: "car, enfin, il n'y a nulle apparence que ce soient les restes de l'ancienne Tour

de Babylone, selon la description que Moyse nous en fait dans l'histoire de la Genèse."

What is most noticeable about his book is the absence of complaints of personal inconvenience or danger. The author takes everything as a matter of course, as a gentleman of the road of his experience naturally would, and makes light of those small mishaps which a superficial traveller, less schooled to the discomforts of a roving life, would record in plaintive detail. Although we have only touched on his journeys in Western Asia, which make up only a third of his lifetime of travel, it is enough to show that he was an observant and indefatigable explorer whose additions to the story of these lands of romance show the manners, customs, and history of peoples who lived when a journey meant travelling, and not merely being carried to another place.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

At a Meeting of Council held on the 22nd February, the following lady and gentlemen were elected Members of the Society :—

Mrs. J. D. Fairley.
Walter H. Kiep, M.B., Ch.B.
F. J. Shand.
John Finlay.
David Pirie.
Alexander Ogilvie.
Lord Provost Alexander Wilson.
Andrew Hendry.
Alfred Harry Roberts.
John Taylor.
James Mowat, J.P.

Lectures in March.

Mr. Vaughan Cornish, D.Sc., F.R.G.S., F.G.S., will address the Society in Dundee, Aberdeen, Edinburgh, and Glasgow on March 1st, 2nd, 3rd, and 4th respectively. The subject of his lecture will be "The Panama Canal and its Makers."

Dr. H. Karl Kumm is unfortunately unable to lecture in Edinburgh on the 17th inst. as intimated. The lecturer for that date will be announced later.

GEOGRAPHICAL NOTES.

Africa.

The Development of the Gold Coast Colony.—In presenting the estimates for the year 1910 to the Legislative Council of the Gold Coast Colony recently, the Governor, Sir John Pickersgill Rodger, gave some account of the progress of the Colony.

In the Northern Territories markets with resident Hausa traders in them are growing up in towns which a few years ago it was considered

unsafe even to visit owing to the unsettled conditions of the surrounding country. The economic development of Ashanti is making steady progress, especially as regards the production of cocoa, rubber, and maize. Both in the colony proper and in Ashanti the extended cultivation of cocoa has been the most marked feature in the agricultural development of the country during the past few years. The industry has been established with comparatively little assistance from the Government, and almost every plantation is entirely owned and cultivated by native planters.

Cocoa, rubber, oil-palms, and kola can all be more profitably cultivated at present than cotton, so far as the colony proper and Ashanti are concerned, but there may very possibly be a field for the development of cotton cultivation in the Northern Territories if the difficulty and the expense of transport can be successfully overcome. Recently a new agreement has been concluded with the British Cotton-Growing Association, under which the Government of the Gold Coast undertakes to pay the association an annual subsidy of £1000 for three years, provided that the association extends its operations into the Northern Territories. In the gold mines the supply of unskilled labour is fairly abundant, and the experiment of introducing natives from the Northern Territories has had satisfactory results; but some difficulty is experienced in obtaining a sufficient number of skilled labourers. The general health of both Europeans and natives employed in the mines has greatly improved, thanks to the enforcement of proper sanitary regulations—a matter in which the mine managers have cordially co-operated with the Government.

As in other parts of tropical Africa, one of the great needs of the Gold Coast is improved communications. A start has been made with the construction of a railway from Accra, and it is anticipated that the line will be open to traffic as far as Mangoase, forty miles distant, soon after the middle of 1910. It is proposed that the line shall be eventually extended to Kumassi, which is already connected by railway with the coast at Sekondi. A survey has been undertaken of the first section of the projected extension. As regards other communications, all main roads are now being metalled and provided with permanent bridges and concrete abutments and steel superstructures, to enable them to be utilised for motor transport. A main trunk road, 260 miles long, is being constructed between Kumassi and Tamale, the capital of the Northern Territories, and this should be available for motor traffic within the next three years.

America.

The Southern United States.—The January issue of the *Annals* of the American Academy of Political and Social Science is entitled *The New South*, and is devoted to a long series of articles dealing with various aspects of the development of the South, especially labour problems and improved methods of agriculture. Of the articles special mention may be made of those on Forest Resources, on Inland Waterways, and on the

Sugar Cane Industry. From the last-named we learn that cane sugar on the commercial scale is only produced in Louisiana and Texas, though small quantities of sugar are produced in Florida, Georgia and South Carolina. A considerable amount of cane is also grown in Alabama, but here it is used only for the production of syrup, chiefly for local needs. Recent improvements are most marked in the direction of the utilisation of by-products, the low-grade molasses being now used as a stock food, and also in a proper rotation of crops, a matter hitherto too much neglected. Ninety per cent. of the sugar used in the United States is still cane sugar, and the tariff on refined sugar practically prevents the competition of European beet sugar. The relation between locally produced beet and cane sugar is interesting. The cane produces a greater tonnage to the acre than the beet, but the sugar content of the beet is greater, with the result that the price of the product is about the same in the two cases. Any great amount of competition between the beet sugar of the cooler states and the cane sugar of the South is rendered improbable owing to the fact that wages tend to be higher in the beet-growing than in the cane-growing regions, while the price of land is also greater in the former case, as the beet is chiefly grown on irrigated land in the arid or semi-arid regions. If these facts are correct, they are of great interest as showing that the South is so far outgrowing the blight of slavery as to be able to compete on more than equal terms with states which have never been slave-holding. The author of the paper is of opinion, on the other hand, that the competition of cane sugar from Cuba (if admitted duty-free) and from Hawaii and the Philippines with the cane sugar of the South may prove serious.

Another article, which is, however, more economic than strictly geographical, discusses the history of agriculture in the semi-tropical and tropical regions of America, and shows that it has never been and is not now on a sound basis. The plantation system, first founded in the British West Indies, was transferred from them to the adjacent continent. In both places it was based upon the negro, and the author is of opinion that it is with the negro that the future lies. The drawing of any probable conclusions as to future developments is, in the opinion of the author of the paper, rendered impossible by the fact that no certain statistics exist to show what part the negro is now playing in the agriculture of the South.

Australasia.

British Expedition to New Guinea.—We regret to record the death by drowning of Mr. W. Stalker, a member of the recent expedition to Dutch New Guinea (cf. xxv. p. 653). Mr. Stalker was one of the collectors of the expedition.

Polar.

The French Antarctic Expedition.—Dr. Charcot and party on board the ship *Pourquoi Pas* arrived at Punta Arenas in the middle of February, and we have been favoured with a copy of his first despatch.

It will be remembered that the Expedition left Havre on August 16, 1908 (cf. this *Magazine*, xxiv. p. 549), with the special object of completing the work of the first French Antarctic Expedition (1903-5). After leaving Punta Arenas in December 1908, the expedition sailed to Deception Island (cf. vol. xxv. p. 326) to coal. Subsequently the ship ran aground, and after having been refloated, journeyed southwards to Adelaide Island, completing Dr. Charcot's previous map during the voyage. Adelaide Island was found to have a curious shape, and to be 70 miles long, with a vast gulf to the south. Beyond this region a new coastline was surveyed for 120 miles, and Alexander I. Land, which Dr. Charcot describes as "ingrate," was reached. Here, owing to icebergs, reefs, and pack ice, no safe wintering place could be found, and the ship was obliged to return northwards to winter at Petermann Island, south of 65°. Here the winter proved relatively mild, but very stormy, and there was some sickness in the party; some interesting excursions were, however, made, especially to the glaciers of the region. With the return of spring Deception Island was revisited, and Bridgman Island in 62° S. visited and studied. The ship was then directed southwards and westwards along the coasts of Alexander I. Land, and reached Peter I. Land, and, voyaging between 69° and 71° S. lat., attained long. 126° W. Dr. Charcot adds that he had hoped to do more, but has done all he could.

The area investigated by the Expedition is well shown on the map in vol. xxi. p. 465, illustrating Dr. Charcot's previous discoveries.

American Antarctic Expedition.—Commander Peary proposes that an American expedition to the South Pole should be fitted out jointly by the Peary Arctic Club and the National Geographic Society. The Peary Arctic Club would contribute the *Roosevelt*, and the aim would be to reach the coast of the Antarctic Continent in March 1911, at a point directly opposite to the base of Captain Scott's expedition. The two camps would be about 2000 miles apart, and at approximately equal distances from the Pole. Commander Peary estimates that, if successful, the American party should reach the Pole in December 1911, or early in 1912. Commander Peary does not propose to conduct the Polar party in person. The *Roosevelt* will be commanded by Captain Bartlett, but further information as to the personnel is not available meantime, though it is stated that the party will be limited to twenty-five, and that dogs, not ponies, will be used for the southward journey. It is hoped to start from New York early in September of the present year, to coal in South America, to reach the coast of Graham Land or Coats Land in the Antarctic summer, and to winter so far south as the 80th parallel, whence a dash will be made to the Pole. The suggested route is well seen in Dr. Bruce's Bathymetrical Map of the Weddell Sea, which appears in vol. xxi. of this Magazine, and it will be seen from this map that the region is still entirely unexplored to the south of the *Scotia*'s track, and the experience both of Dr. Bruce and others is that navigation here presents great difficulties. Dr. Bruce's scheme for a new Antarctic expedition (vol. xxiv. p. 200) involves a crossing of the Antarctic Continent starting from a point to the west of that suggested by Peary.

General.

Sheffield Meeting of the British Association.—It is announced that Dr. A. J. Herbertson is to be president of Section E (Geography) at the Sheffield meeting of the British Association, which is to be opened on August 31st next, under the presidency of Professor T. L. Bonney, F.R.S.

Causation of Pellagra.—According to an announcement in the *Times* a Committee has been formed for the study of this somewhat mysterious disease. As is well known, pellagra is very prevalent in Lombardy and other parts of Italy, and it has also been recognised in India, Egypt, South Africa, the United States, and elsewhere. It has been usually believed to be due to the eating of unsound maize, but Dr. Sambon believes that it may be due to a Protozoon parasite, as sleeping sickness is, and that this parasite may be distributed by sand-flies, as that disease is by tsetse-flies. The matter is one of great importance because the disease shows the same tendency to spread which was observable in the early days with sleeping sickness, and as with that disease the early stages are difficult to recognise. The disease is practically confined to agricultural labourers, and it is quite possible that it may be found to be more widely spread than is at present believed. The Committee has the support of the Colonial Office and the London and Liverpool Schools of Tropical Medicine.

EDUCATIONAL.

In the November issue of the *Journal of Geography* there is an article by Professor Rollin Salisbury of Chicago on the teaching of geography, which contains some criticisms of modern methods of teaching. Professor Salisbury has found among College students a remarkable ignorance of two sets of geographical facts, first of the position of places, and second of the significance of geographical names. He is of opinion that ignorance in these respects is more widespread than it was in the days before the teaching of geography was reformed. To illustrate his meaning, he gives an account of the results of an examination test which was given to about seventy-five College students, most of whom were in the early years of their College courses. The age of the students is not given, but we presume they were from eighteen to twenty or thereabouts. The students had come up mostly from public schools (in the American sense), but about one-third of the total were from private schools.

The test may be briefly described. On a blank wall-map of the United States, ten states, ten cities, ten rivers, ten bays, were successively pointed out, and the students were requested to write down the names of each. Ten mountain groups and ten lakes were then named and the students were requested to name the states in which they were respectively placed. They were then asked to name the chief city in ten states whose names were given. The next question

referred to railways and canals within the States, and was followed by one asking for the smallest and largest state, and those with the largest and smallest populations. The tenth, the only question in general geography, asked for the position of certain towns, rivers, etc., in various parts of the world with a characterisation of each name given. A final question asked for definitions of (1) forest reserves; (2) irrigation projects; (3) dry farming, and was the only one which demanded the employment of any intelligence whatsoever.

The results of the test were somewhat unsatisfactory, and upon them Professor Salisbury bases his criticism of current geographical teaching in the States. To what extent this teaching is thorough is a question which may safely be left to the teachers of the States, but on general grounds we must protest against the idea that good geographical teaching has for its end the enabling of the student to answer so appalling a string of questions. Nor can we agree with Professor Salisbury that the poor results which he obtained are a proof that something is wrong in the teaching. In the first place, it is difficult to see how states, rivers, cities, etc., could be pointed out on a wall-map to so large a class in a fashion which permitted the making of a fair test: and second, we think that Professor Salisbury does not allow anything for the feeling of intolerable tedium which his questions would necessarily produce in an intelligent student. Professor Salisbury ascribes such statements as that "Arizona is the capital of Little Rock," and that "*Rock* Island is the smallest state," to the fact that it is no longer the custom to teach geography from text-books. We should, on the other hand, explain them as the natural result of attempting to convert an intelligent being into a penny-in-the-slot machine. There are probably many persons in this country, and persons whose knowledge of geography is considerable, who share with Professor Salisbury's students an incapacity to "locate" exactly the State of Oklahoma, the lake of Skaneateles, the mountains of Ouachita, and so forth, and yet have not found their progress through life impeded thereby. There seem to us few things more certain than the fact that few, if any, human beings are so constituted as to be able to assimilate satisfactorily a whole gazetteer, even if it be only a Gazetteer of the States. This being so, why should ignorance of a set of names chosen at random be taken as a condemnation of modern geographical teaching? This teaching may still be on wrong lines, but we do not think that tests of the kind described above prove the fact, nor are we convinced that the students who answered these questions best necessarily knew more geography than those who mixed up Ohio and Iowa, Arkansas and Arizona, both offences which we find more pardonable than does Professor Salisbury, in view of the nature of the examination. Unless the fact is related to some other fact, is it of the slightest interest to any human being to know that Rhode Island is the smallest State of the Union? Many of us retain from an earlier phase of geographical teaching a knowledge of an analogous fact in regard to the counties of England, and which of us can truthfully say that this piece of knowledge has the slightest interest, or has ever been of the smallest use to us?

NEW BOOKS.

EUROPE.

Italian Highways and Byways from a Motor Car. By Francis Miltoun. London: Hodder and Stoughton, 1909. *Price* 10*s.* 6*d.*

The traveller who is not obliged by purse or inclination to go from point to point by rail, but who can take the pleasanter—if costlier—way of the open road, will find in this book an invaluable *vade mecum*. The author discourses of the many sights by the way, giving much information about places which are little known to the ordinary tourist, and at the same time lending to it that spice of literary charm which suffices to lift his work into a category higher than that of mere guide-book. Mr. Miltoun advises the motorist in Italy to make three vows before he crosses the frontier—viz. not to attempt to see everything; to review some of the things which he already knows; and to leave the beaten track and try to discover something which none of his friends have seen. The advice seems to be sound, and the author has acted upon it in compiling his guide for motorists (or *automobilists*, to use the name which he, being an American, more correctly adopts). He follows the highways of old Roman days faithfully in his motor car—the Via Æmelia, the Via Appia, and others—and gives itineraries containing both the ancient and the modern place-names, the road which is most readily traced to-day being apparently the ancient Via Æmelia. Some of the roads are well described in the classification given to them by the Touring Club Italiano as "*mediocre e polveroso*," and the state of the weather makes a vast difference to their surface. The merits and demerits of various hotels are described, and useful information afforded to the motorist as to the charges customary in Italy for garage and motor spirit; both of which appear to be high in comparison to those obtaining at home.

There is a good chapter which treats of Italian men and manners. In it the author touches on the *mezzadria* system of working land, the special feature of which is that the produce of the farm is divided between landlord and tenant; and, in this connection, he is somewhat severe on our British methods of agriculture when he remarks that "the harvests in England are worked with sickle and flail, or with out-of-date patterns of American reapers." Perhaps he is more familiar with Italian than with British rural life!

The illustrations by Miss Blanche M'Manus are clever, and there are a number of useful little maps and plans.

Geological Map of Scotland. By Sir Archibald Geikie, D.Sc., LLD., F.R.S. With Descriptive Text. Edinburgh: John Bartholomew and Co., 1909. *Price* 7*s.* 6*d. net.*

Probably all those who interest themselves to any extent in the geography of Scotland know and cherish Sir Archibald Geikie's *Geological Map*, with its instructive explanatory notes, so that a new edition is something of a geographical event. On unfolding the new map one's first impression is that the changes in the interval of seventeen years have been very extensive. Closer inspection shows that this impression is due in part to some alterations in the tints used in the new edition, for, owing to the fact that the Geological Survey of Scotland has not yet been completed, the Outer Hebrides and a considerable part of Argyll and Inverness have had to remain in the undetailed state in which they

appeared in the 1892 map. The Lowlands had, of course, been surveyed in detail prior to the publication of that map and remain unaltered; but in many parts of the Highlands the changes due to the progress of the Survey are considerable. This is especially true, for example, in the vicinity of Oban, and in the islands of Arran and Islay. The appearance of Triassic beds in the former of the two islands marks a striking change as compared with the earlier map.

The explanatory text, though remaining unaltered in essentials, has been modified to bring it into harmony with the changes in the map. The modifications do not in all cases seem to be quite adequate, for we note that while the map shows Torridonian beds in Islay and Colonsay—a great change from the earlier map—the text preserves the statement that the island of Rum marks the southern limit of these beds.

The format of the new issue is the same as that of the previous one, but we note with satisfaction that the explanatory notes are more firmly fixed than they were in the earlier issue, in which they would not bear much handling. The method of index lettering of the different rocks has been retained as in the first edition. The method has some advantages, though for rapid reference we prefer the system of large and clear numerals employed in the *Geological Map of the British Isles*, published by the Geological Survey. The map is, however, more than ever indispensable to the teacher.

Isafold: Reisebilder aus Island. Von Ina von Grumbkow. Berlin: Dietrich Reimer, 1909. *Price* 6 *marks.*

Wüstenritte und Vulkanbesteigungen auf Island. Von Carl Kuchler. Altenburg, S.A.: Stephan Geibel, 1909.

In the summer of 1907 an expedition consisting of Dr. Walther von Knebel, Herrn Hans Spethmann and Max Rudloff, a young artist, set out to investigate the enormous crater of Askja in Central Iceland. Part of their plan was to explore a lake about two miles long by one and a-half miles broad which occupies the SE. corner of the crater. On July 10, 1907, Herr Spethmann left the camp on a geological excursion leaving his two companions to start on a first trip on the lake in a small boat, which had been transported for the purpose. On his return to camp ten hours later von Knebel and Rudloff were missing, and from that day to this no trace has ever been found of them.

Fräulein von Grumbkow, who was betrothed to Dr. von Knebel, organised a search expedition in the following year with Dr. Hans Reck, one of his friends, and her book gives an account of their expedition. Their main object was, of course, to search the vicinity of the Knebel Lake in Askja for traces of the unhappy expedition, and in this they were entirely unsuccessful, but in addition they made a very extensive tour through the country. Starting from Reikjavik they made a round of the Reykjanes peninsula, then past Thingvalla and Geysir (both of which, as hackneyed subjects, the authoress considerately refrains from describing; an example which future book-makers may well follow), to Hecla. Thence past Kirkjufell and Holt to Laki, and within a few miles of the Vatna Jökull, back again to the dreaded Sprengisandur route which they followed to Akureyri; Herr Reck and a guide making a circuit of the Tungnafellsjokull over a difficult pass, *en route*. From Akureyri they made another very extended tour by the Myvatn and Herthubreith ascended by Dr. Reck for the first time, to Askja and back. The return to Reikjavik was made by the ordinary north-west route.

We cannot speak too highly of this charming book. Icelandic travel at its

best is not child's play, and Fräulein von Grumbkow's journey, which included many forced marches over difficult country, was a most notable achievement, but her description of it is written throughout in the most simple and unaffected manner, though at the same time with very considerable literary skill. For a work of its size it will have considerable value as a book of reference, especially with regard to Askja, and we know of no book of Icelandic travel which will be read with greater interest by the general reader. It is well illustrated with original photographs, and even more attractive reproductions of water-colour sketches by the authoress.

Herr Kuchler's book is in many respects the antithesis of Fräulein von Grumbkow's. It describes a series of tours in the north of Iceland, the most extensive one embracing an expedition to the Myvatn and the volcanic hill-district to the north-east. It has little or no geographical value, and we should imagine little interest to the general reader. The inflated and bombastic style of the narrative is hardly warranted by the author's somewhat ordinary achievements, and the reader soon wearies of the numerous tributes to the author's worth which appear to have been showered upon him by Icelanders of distinction. The numerous bibliographical references refer almost exclusively to the author's previous works. The book is profusely illustrated with photographs, mostly original, some of which are good.

Siena: The Story of a Mediæval Commune. By Ferdinand Schevill. London: Chapman and Hall, Limited, 1909. *Price* 12*s.* 6*d. net.*

Siena has a personality, a charm, which reveals itself at every stage of its restless history. Its constant rivalry with Florence, its enterprise, its sudden impulses, the ebb and flow of its fortunes, must always attract our sympathy, and Mr. Schevill has done full justice to his subject. He has chosen to write not a chronological record, but a series of studies which cover the birth, life, and decline of the *Civitas Virginis*, and very sound and admirable work they are. He has laid both standard and periodical literature under contribution, and may be congratulated on his achievement. But he has wisely spared the reader an excess of footnotes, and has gathered his authorities in a list at the end.

High Albania. By M. Edith Durham. London: Edward Arnold, 1909. *Price* 14*s. net.*

This is an interesting and unpretentious story of an eight months' tour through a little-known region of the Balkans. Of geography in the strict sense there is little, but the account of the customs and habits of the people is full of interest, and the author had many strange adventures during her visit.

The great fact in the life of the people of the mountains is the existence of a law of blood-vengeance, binding not upon the individual but upon the group, or even upon the tribe. The law does not affect women, and the whole system of vendetta is carried on under a very elaborate system of rules. One of the insults for which blood-vengeance is demanded is for a man to marry a girl betrothed to another, an occurrence which the early betrothal of the girls seems to render relatively frequent. The system is indeed less one of betrothal than of selling, the girls being sold as infants, or even before birth. According to Miss Durham's observations the young men accept the brides purchased for them without protest, whereas the girls not infrequently refuse to take the husbands for whom they have been bought. Apart from the extreme step of eloping with another man, they can escape an unwelcome husband by a vow of virginity. This vow gives certain

privileges, as, for instance, the power to inherit land, and in some instances such women wear male dress.

Miss Durham's whole account of the social polity, and of the position of women in general, is most interesting. Among other points she notes that the mountain women, though they work much harder than the women of Scutari, are in many ways freer. The book is illustrated by a map, photographs, and text-drawings. As we have indicated, although it does not profess to give the results of elaborate research, it gives an interesting and instructive picture of the life of the people.

Baedeker's Mittelmeer. Hafenplätze und Seewege nebst Madeira, den Kanarischen Inseln, der Küste Marokkos, Algerien und Tunisien. Mit 38 Karten und 49 Plänen, 1909. *Price* M. 9. Leipzig: Karl Baedeker.

A new "Baedeker" is always welcome. It means that infinite pains have been taken to ensure the latest and most reliable information concerning fresh fields for tourists. Although the present volume does not include much new ground, yet it brings together in one convenient handbook the coasts and ports of all the Mediterranean countries, and gives a complete itinerary of all the principal shipping routes. Besides including the Black Sea and Russian Riviera, it takes one down the coast of Morocco and across to Madeira and the Canary Islands, which are dealt with in well-considered practical detail. To all health and pleasure voyagers this volume will prove a most invaluable companion, and an English edition would certainly be welcomed. Although the "Seewege" are fully described in the text, it seems an obvious omission that they are not shown on the maps.

Baedeker's Norway, Sweden, and Denmark. With Excursions to Iceland and Spitzbergen. With 43 Maps, 26 Plans, and several Panoramas and Ground Plans. Ninth Edition, revised and augmented. 1909. *Price* 8 Marks. Leipzig: Karl Baedeker. London: T. Fisher Unwin.

The interior of Norway and Sweden is still comparatively new ground for the ordinary tourist, especially as the excursions of the great majority are necessarily regulated by the facilities of travel. They are dependent on the organisation of railways, coach routes, and hotel accommodation. That organisation is, however, rapidly developing every year, and nothing shows this development more strikingly than a comparison of the present edition of Baedeker's handbook with any of the earlier editions. Compared with the sixth edition, we find that in this the ninth edition, the number of maps and plans is increased from 42 to 70, new routes have been opened up in all directions; even Spitzbergen is held forth as a new sensation, although there are still no inducements in the way of hotels.

Baedeker's Switzerland. With Adjacent Portions of Italy, Savoy, and Tyrol. With 72 Maps, 19 Plans, and 12 Panoramas. Twenty-third Edition. 1909. *Price* 8 Marks. Leipzig: Karl Baedeker. London: T. Fisher Unwin.

Probably no guidebook is more popular than "Baedeker's Switzerland," and none better deserves its popularity. It has to be borne in mind that even in Switzerland, every year sees new regions opened up to the enterprising tourist, new winter resorts established, new peaks rendered accessible for climbers, new hotels and sanatoriums for those in want of rest and health, and to keep pace with all these changes the latest "Baedeker" is quite essential. Among new additions the new map of St. Moritz is such an improvement in artistic cartography as to

make one wish for its pleasing grey tints on the older maps. It may be mentioned that although this new edition is considerably extended, it is not increased in price.

ASIA.

My Thirty Years in India. By Sir Edmund C. Cox, Bart. London: Mills and Boon, Limited, 1909. *Price* 8*s. net.*

We can well understand that many of our readers and the public may think that, of late years, we have had a plethora of reminiscences of India. But the volume now before us presents to the reader one particular phase of Indian experience, viz., the life of a police officer in the Bombay Presidency, which is not probably "caviare to the general," and as it comes, first hand, from one who retired from the service not much more than a year ago, it has all the interest of freshness and spontaneity. There is no attempt at fine writing. The style is easy, simple, and almost colloquial, and this, although it appears the writer has published some other works which have met with a fair amount of acceptance. The author takes the reader into his confidence in a number of ways. He leaves him no hallucinations about the "gorgeous east" or the "pagoda tree." He tells us that he first tried tea-planting, then teaching, then the political department, and finally the police, where it took him twenty years to reach a post carrying as much pay as he had drawn as an assistant political officer in an obscure native state. He retired after nearly thirty-two years' service, having saved about £500. Like all Government servants he was sent from station to station without the smallest reference to his own wishes, and he grumbles at this, freely and naturally, as every Government official invariably does. The great attraction of the book is the frankness with which the author describes his own sensations and feelings throughout the various vicissitudes of his career. To this we may add that his duties led him into some of the most interesting parts of the Bombay Presidency, which he describes accurately and graphically. Officially he was brought into contact with the criminal classes, from the seditious agitator to the dacoit and burglar, and his narrative abounds with amusing descriptions of crime as it is practised in Bombay. The narrative is diversified with accounts of holidays in Poona and elsewhere, which were most necessary interludes in so strenuous a life. Notwithstanding his training and experience, the writer thinks well of the ordinary natives, and his observations on their character, capacities, and limitations are well worth attention. He is transparently honest in his account of what he saw and thought, and in no part of his book does he write for effect. At a time when the eternal question of police reform is being mooted in India and at home, this contribution to the general subject is well worth perusal so far as the Bombay Presidency is concerned.

Japan in World Politics. By Henry Dyer, C.E., M.A., D.Sc. London: Blackie and Son, Limited, 1909. *Price* 12*s.* 6*d. net.*

"Let observation with extensive view,
Survey mankind from China to Peru."

So sang Dr. Johnson some centuries ago, and this is what Dr. Dyer has done in the thoughtful and suggestive volume now before us. He is, or should be, well known to our readers because of his former excellent work *Dai Nippon*, which was reviewed in the July number of this Magazine in 1905, and because he is a member of the Council of this Society. This volume may be considered in some respects as a continuation of, or supplement to, its predecessor. In the former he dealt exhaustively with the "economic, industrial, and political aspect of things

Japanese," as they appeared in the early stages of the Russo-Japanese war. In this work he takes a comprehensive view of the changes caused in economic and industrial problems, and above all in politics, which are the inevitable result of the Japanese victory. Of the magnitude, far reachingness, and the permanence of these changes Dr. Dyer has no doubt. "The developments which have taken place in the Far East have profoundly affected the conditions of the Western policy in that part of the world, and, hereafter, the potentates of Europe will have reason to think twice before shaking their mailed fists in the faces of the nations in the Far East. There must be a profound change in the methods of dealing with them. The days of crooked diplomacy, gunboat arguments, veiled threats, and monstrous indemnities must be looked upon as past, and all questions must be discussed and settled on a basis of international equity. . . . The success in arms of Japan has done more to convert the peoples of the West to a sense of what is due to international morality than all their religions. It has effectually arrested European ambitions in the Far East, and put an end to the scramble which took place not only for 'spheres of influence,' but also for 'leases,' not to speak of more permanent possessions." In these sentences Dr. Dyer gives us the keynote of this work, and the *motif* can be traced in every chapter. He is careful, however, not to dogmatise, and in the preface he very modestly claims, that the book is merely "an introduction to the study of what may be called the dynamics of world-politics which have their centre in Japan." The object of the book is practical, viz., "to show not only the desirability, but also the possibility of a reconciliation and a mutual understanding of the East and West," and he very truly remarks, "No man can undertake a more important work than that of doing something, however little, to promote the fraternity of nations and the abolition or diminution of standing armies, by the education of public opinion in the direction of peace." Perhaps the most interesting parts of the work are those in which he describes the recent awakening of China, the forms and methods of evolution which even now are becoming visible in that empire, and the calm and dispassionate reasoning by which he arrives at the conclusion, that "it is a very safe prophecy to say that before the present century has been completed, China will have taken a very important part in moulding the destinies of the world." As we remarked of his *Dai Nippon*, this is a serious work; it bristles with pregnant observations which arrest the attention and compel thought. The writer has had very exceptional experience of Japan and the East generally, and his opinions and conclusions demand and deserve earnest study. He sums up the present situation thus: "In the future the peoples of the West must entirely change their point of view in their dealings with those of the East. Mutual advantage and friendly co-operation must take the place of selfish aggression and exploitation. Reason and morality must take the place of armed force and aggressive selfishness." In bringing about these desirable changes Dr. Dyer frankly admits, that he looks to the advance and extension of Socialism, and here he enters on debatable ground in which we may not follow him. But we trust we have said enough to convince our readers that this is an exceptionably able and instructive work, dealing comprehensively and impartially with some of the greatest economic and political problems of the day.

China: Its Marvel and Mystery. By T. Hodgson Liddell, R.B.A. With Illustrations in Colour by the Author. London: George Allan and Sons, 1909. *Price* 21*s. net.*

Mr. Liddell tells us that he undertook his journey to China solely to paint pictures of the country. The handsomely got up volume now before us goes to prove that he

returned with a well-filled portfolio, and the pictures which are reproduced give a good idea of the beauty and interest of the scenes which he so skilfully depicts. If there is a certain feeling of hardness in some of the water-colours, and especially in some which find a place in the earlier portions of the book, this is no doubt due to the process of colour-printing, and not to any defect in the original sketches.

Mr. Liddell was so fortunate as to obtain an edict from the hand of the late Empress Dowager of China permitting him to sketch in the Summer Palace near Pekin ; and there he was installed and allowed to live and to go to work at his painting under an escort of mandarins provided by the Wai-wu-pu, or Chinese Foreign Office. The pictures in the latter part of the book give a good idea of the beauty of the setting and of the buildings in the grounds of the palace, where evidence is seen of the influence of the Italian priestly architects who were called in by the Manchu emperors to assist in planning the palace, just as they were similarly invoked by the Moguls in the case of Delhi and Agra. The sketches of other parts of China visited by the artist, of which we may mention especially some of Hangchow and of the Great Wall are also of much interest. As Mr. Liddell remarks, "Words fail to describe all the beautiful scenes in China," and, in speaking of his visit to Japan, he compares the two countries artistically, very much in favour of China. How true this dictum is, is most apparent to those who really know something of the scenery in the interior of both these lands.

The letterpress is subsidiary to the pictures. It contains an account of the artist's travels, and is pleasantly written, if without any special literary merit ; but it cannot be said to justify the somewhat ambitious title which the author has selected for his book.

We notice various errors in the text: some of them possibly typographical. For instance, *Shang Ti*, the Chinese name for the Supreme Being, is printed as *Shang Li* ; *Moji*, the well-known port at the entrance to the Inland Sea of Japan, appears as *Moja* ; and the *Cryptomeria*, or Japanese cedar, is called *Cryptomaria*. These are minor blemishes, but they detract a little from the value of the book.

La Ville au Bois dormant. De Saigon à Angkor en Automobile. Par le Duc de Montpensier. Paris: Plon Nourrit et Cie, 1910. *Price* 15 *francs.*

In a strongly-built 24 to 30 H.P. Lorraine-Deitrich motor car, the Duc de Montpensier and comrades set forth, in March 1908, to travel from Saigon, the capital of French Cochin China, to the famous ruins of Angkor, being the first to attempt such a feat. The difficulties were enormous, but gaiety and perseverance conquered them. The Duke tells the tale in a humorous manner in this beautifully printed and illustrated volume, and protests that, while every globe-trotter visits the temples of India, those of this French colony are unknown because there is no good road to them, although the French are so celebrated as roadmakers. Hence the fairy-like title to his book—*The Town in the Sleeping Wood*. He insists that the temples and palace of Angkor are far finer than anything in India, but, judging from the photographs so finely reproduced in this volume, the temples and palace of Angkor are largely a mass of ruins. To reach them occupied our travellers about a month from Saigon.

Like all the ancient temples of Cambodia, those of Angkor were constructed by Brahmans coming from India about a thousand years after Christ. When these Brahman warriors invaded the Cambodian territory, they brought with them their priests and the artists who constructed these temples ; but, in order to execute such immense works, they employed the aborigines in the quarrying of stones, the transport of materials, and probably in placing the stones in position.

When the temples were constructed, the kings made them over as monasteries for the benefit of the Brahman priests, while the natives of the district became the slaves of the monasteries. Sanscrit inscriptions found among the ruins tell us, for instance, that one monastery had 8000 to 10,000 slaves, 400 pounds of butter daily, 5000 oxen annually, 2000 buffaloes, and so on. It is estimated that the temples of Angkor-vat took at least two hundred years to build, and that 2000 men were daily employed there. In the thirteenth century the Siamese invaded the country and defeated the Brahmans, whereupon the Cambodians rose against their oppressors and either expelled or killed them. These slaves furiously attacked the temples, which they imagined had sheltered hostile gods, and their vandalism explains the present degradation of the monuments. Two maps of the route taken by the author are appended for the benefit of future visitors to Angkor.

Letters from China, with particular reference to the Empress Dowager and the Women of China. By SARAH PIKE CONGER. London: Hodder and Stoughton, 1909. *Price* 12s.

If it be necessary to plead justification for adding one more to the long list of books on China recently given to the world, the author of this volume may fairly claim that she has some experiences which are worth recording; and, if the reader can overcome objection to a somewhat sententious style, it will be found to be of serious interest in many parts. Mrs. Conger's husband was United States Minister at Peking from 1898 to 1905, and she was by his side through the siege of the legations in 1900.

The author has much to relate of that eventful time, and in her letters and journals she gives a vivid account of the siege and of the gallant defence which the small band of foreigners, shut up in their beleaguered compounds through the heat of a Peking summer, made against the determined attacks of Boxers and Chinese troops, until the relieving armies came to their rescue. The story of the siege has been often told, but it stands repetition, and Mrs. Conger's account of it is well worth perusal, for it will be found to be of absorbing interest. The events recorded are all so recent, and yet, in the light of the changes which have taken place in China since the year 1900, it seems so long ago!

Mrs. Conger appears to have been favoured in a remarkable degree with the confidence, and even with the friendship, of that extraordinary personage, the late Dowager Empress of China. Mrs. Conger frequently met and conversed with her on familiar terms, in a way that probably no other European has done, and she seems to have formed a high opinion of her character. Mrs. Conger speaks of the Empress as "a misrepresented woman," was impressed with her gentleness and kindness, and says that "her intuitive ability to perceive and conceive is not easy to surpass, nor even equal, by man or woman." The visits of the wife of an American Minister to the Dowager Empress, which were continued after the events of the siege, and the determined attempts to destroy all the Europeans in Peking, quite naturally gave rise to much adverse criticism, and there may be a certain element of special pleading in Mrs. Conger's estimate, but she speaks with special knowledge, and her opinion is worthy of respect. She also managed to see a great deal of the inner home life of the wives and daughters of high Chinese officials and nobles. The picture which she draws is an attractive one, and she has some suggestive things to relate as to their sufferings at the hands of the Boxers and native soldiers at the time of the rising.

The book is illustrated with a number of good photographic views and portraits, and we can recommend it to all who are interested in things Chinese.

AFRICA.

In the Grip of the Nyika: Further Adventures in British East Africa. By Lieutenant-Colonel J. H. Patterson, D.S.O. Many Illustrations and 9 Maps. London: Macmillan and Co., Ltd., 1909. *Price* 7*s.* 6*d. net.*

We have found it as difficult to lay down this book unfinished as was *The Man-Eaters of Tsavo.* There is no pretence in it of fine writing, but the narrative is extraordinarily effective and seems really to bring the country and the incidents enacted before one's eyes. It is a record of two expeditions in British East Africa, one in the Kitui district, south of Mount Kenia, and the other to the north of that mountain as far as Marsabit. The second was far the larger undertaking, and had for its object to fix the eastern boundary of the Northern Game Reserve, that marvellous sanctuary which possesses an area roughly equal to that of Scotland and Wales put together. What a sportsman's paradise it is! Teeming with game of every description, but with the vicious rhino far too common for comfort. The writer saw 16 of them together on one occasion, and several times had to guard the *safari* from them by lines of scouts. A beautiful country too in the early months of the year, though even then the northern desert (*Nyika*) proved arduous. The author gives carefully drawn maps, correcting some of those previously published, and adds much information for the benefit of future travellers. He had the misfortune on his return to civilisation to find that over two hundred photos which he had taken had been ruined by the excessive heat and damp, but those reproduced are excellent.

Egypt. By Pierre Loti. Translated from the French by W. P. Baines, and with 8 Illustrations in Colour by A. Lamplough. London: T. Werner Laurie, 1909. *Price* 15*s. net.*

Pierre Loti has returned to Egypt, and in this series of vignettes he sketches visits, largely nocturnal, paid to various scenes of interest, whether or not of common resort. Such descriptive work, vivid always, and touched ever and anon by his delicate observation and fancy, shows his powers at their best. It is true that often he places before our eyes something that strikes a jarring note—a group of grotesque tourists, "Cooks and Cookesses," or an uncanny mummy. But though we resent the intrusion, we are conscious that the effect desired by the writer has been attained, and we confess his skill. The translation has been well done, and (except for "badigeoned, p. 243) betrays no trace of the original. Whether the credit be due to the author or the translator, we have specially appreciated the chapter "An Audience of Amenophis II." These audiences, we may mention, always conclude before noon, when the electric lights are switched off. In their delicacy of colouring the illustrations are a fit match to the text.

GENERAL.

Hazell's Annual, 1910. Revised to November 30, 1909. Edited by Hammond Hall. *Price* 3*s.* 6*d. net.* London: Hazell, Watson and Viney, Ltd., 1910.

Hazell's Annual Guide to the New House of Commons. Price 6*d. net.*

This useful annual, with its handy supplement, presents the usual features, but has some special articles of great interest, among which we note one on "The Coloured Races of the Empire," by Sir Harry Johnston. The annual summaries of scientific progress are, as usual, excellent, and we note that the one on Geography is well up-to-date, and remarkably comprehensive in view of the limited space available.

Norwegian Self-Taught, with Phonetic Pronunciation. By Captain C. A. Thimm. Fourth Edition, revised and enlarged by P. Th. Hanssen. London: E. Marlborough and Co., 1909. *Price* 2*s.* 6*d.*

We have briefly reviewed here various members of this series, and the present may be a good opportunity for pointing out in more detail the features of the books composing it, the present issue being taken as an example of those dealing with European languages. The general scheme of all is the same, which has the great advantage that the traveller who is familiar with one, can readily make himself acquainted with another. The general resemblance is of course accompanied by difference in detail, according to the use which the traveller is likely to make of the language. Thus, in the present volume, apart from phrases and words of use to the general tourist, special attention is given to words and phrases relating to fishing and shooting, as being the subjects most likely to interest an intending traveller to Norway. At the end there is a very useful list of books relating to the different foreign languages included in the series. This is an excellent feature, and the only improvement which we can suggest here is that the names of some exclusively foreign dictionaries should be added. Every one who has made some progress with French or Italian knows how useful such dictionaries as those by Larousse and Melzi respectively are, and the names of such dictionaries might well be added for the sake of more advanced students.

The prime object of the series must, however, always remain the facilitating of the traveller's movements, by furnishing him with the words he is most likely to need, and this object they seem to us to carry out most admirably. A traveller ignorant of the Norwegian language, who takes the excellent little volume named above with him, will certainly learn more from his travels, and have fewer difficulties, than one who neglects to do this.

Persian Self-Taught (in Roman Characters), *with English Phonetic Pronunciation.* By Shayk Hasan. London: E. Marlborough and Co., 1909. *Price* 2*s.* 6*d.*

Egyptian Self-Taught (Arabic). By Captain C. A. Thimm. Third Edition, revised and enlarged by Major R. A. Mariott, D.S.O. London: E. Marlborough and Co., 1907. *Price* 2*s.* 6*d.*

Much of what has been said above in regard to *Norwegian Self-Taught* applies, with variations, to the two books named above. With the necessary differences due to the fact that these deal with oriental languages having alphabets of their own, the plan is the same. The Egyptian manual is intended to permit the traveller to make himself understood in Egypt and the Sudan, while the Persian volume, as well as assisting the traveller in Persia, Afghanistan, etc., is of interest to the student and scholar. Some very interesting geographical conclusions might be drawn from the different types of phrases found in the two volumes, but we shall content ourselves here with a brief recommendation of both to travellers in the regions concerned.

Geography, Structural, Physical, and Comparative. By J. W. Gregory, D.Sc., F.R.S., Professor of Geology in the University of Glasgow. London: Blackie and Sons, Ltd., 1909. *Price* 6*s. net.*

Up till now teachers have been seeking in vain for a text-book to use in their highest class—one which, while providing a summary of what has been learned in previous years, would also treat the subject in a comprehensive manner. Professor Gregory has supplied that want in the handsome volume before us. Parts I. and II. deal with the Earth, its structure and materials; its forms and how they are made—in a word, shows Geology as a handmaid of Geography. Part III. treats

of the influence of the atmosphere and oceans, and Part IV., consisting roughly of two-thirds of the book, is descriptive. The appendices give a list of geological systems, and a list of authorities which should prove a valuable guide to further reading. There is a copious index. In such a work numerous illustrations would be a drawback, and the author has wisely chosen to employ few, but these are of outstanding merit, and fix the attention on the most important points. The maps are necessarily on a small scale, but the avoidance of detail entirely overcomes this disability, while special features such as deltas are fully illustrated by sketch-maps in the text.

There are one or two trifling inaccuracies which may be noted for correction in a future edition; the use of the word "Scotch" on page 51; the Märjelen See, page 74; Scafell *Pike* is the highest peak in England, page 108; the reference and the shading do not correspond in figure 89; and there is no mention of the wheat production of Argentina.

Those who have read Professor Gregory's previous books are well aware of his charming style, and the present volume is an object-lesson in this respect to all writers of text-books. While strictly accurate in the use of words and lucid in expression, the author avoids piling on technical terms, and thus removes needless obstacles from the path of the student.

Agriculture in the Tropics. By J. C. Willis, M.A., Sc.D. Cambridge: University Press, 1909. *Price 7s. 6d. net.*

This volume is the most recent addition to the Cambridge Biological Series, and is a most successful attempt to deal with a subject on which too little has been written in our language for the general reader. The work is entirely free from the technical details which are of interest to the expert alone, and does not profess to be more than an elementary treatise. The first of the four parts into which the work is divided is concerned with the preliminaries to agriculture, and deals in a simple way with such topics as the land and the soil, the essential climatic factors, the supply of labour, the means of transport, the development of tropical agriculture from primitive times, and the introduction and acclimatisation of new species. The second and largest portion of the work treats of the principal economic products cultivated in the tropics. The writer gives a description of the chief plants, and also a brief account of the methods by which they are prepared for the market. Mention might be made of the description of the manufacture of tea and of sugar, while the story of the rise and decay of successive industries in Ceylon, where the writer is director-general of the Royal Botanic Gardens, is exceedingly interesting.

Although the third and fourth sections of the book are evidently intended for those who look forward to an administrative career in the tropics, they are of very great interest to the general reader. The latter half of the volume is really a plea for the amelioration of tropical agriculture, and in this connection the author has many valuable suggestions to make. In his opinion the great obstacles to the improvement of agriculture in the tropics are the ignorance, the poverty, the indolence, and the conservatism of the peasant cultivator. The contrast between an estate carried on under the skilful guidance of a European manager, and the land cultivated by the native too often illustrates the lamentable condition of native agriculture.

The author evidently has little faith in anything being done by the direct instruction of the adult native, but thinks that much might be accomplished by the establishment and extension of school gardens, such as are already at work in Ceylon and the West Indies, in which the children acquire a sound training in the

elements of agriculture. Such experiments are, of course, attended with difficulties, not the least of which are the finding suitable instructors and the caste system, which presents a great obstacle to practical work, for the higher the caste the more averse is the man to hard physical labour.

By dividing up the land into blocks, and apportioning one block to the Malay section of the community, another to the Chinese section, another to the Japanese, and so on, and by the intermingling of the areas devoted to village agriculture with the larger capitalist estates, the author thinks that an incentive might be given to the native to follow the methods of agriculture adopted by his successful neighbours.

The author has some very instructive things to say in reference to the financial side of the question, and favours the establishment of co-operative credit societies, first instituted at Würtemberg by Raiffeisen, wherever they are required, and are likely to meet the needs of the villagers. In other cases, it might be better to begin with co-operative seed supply stores, financed either by local capitalists or by Government, from which the peasant agriculturist could obtain seed at a rate of interest of, say 12½ per cent., to be paid in kind when he reaped his harvest.

The opening up of markets convenient to the grower, the improvement of the means of drainage and of transport, the institution of experimental stations, and the creation of a department of agriculture to attend "to introduction of new and better kinds of plants, breeding of improved local races, the attacks of disease, experiments with cultivated crops, methods of growth, rotation of crops, harvesting, curing, and marketing, experiments with machinery," such are some of the lines along which the author thinks that the progress of tropical agriculture lies.

It is to be hoped that the author will make a further contribution to this discussion, for in several of the chapters there is room for fuller treatment. Too great praise cannot be bestowed upon the beautiful photographs with which the volume is illustrated. They add much to the value of a useful work.

Promenade autour du Monde. Par Ivan de Shaeck. Paris: Plon, 1910. *Price* 10 *francs.*

His Imperial Highness the Grand Duke Boris of Russia left Paris in December 1901 to travel round the globe with a suite which included the author as his secretary. After visiting Egypt the party sailed to Aden where, the author remarks, "the British, thanks to physical exercises and sport, resist better than other nations the deleterious influence of tropical climates." Then they sailed to Ceylon and saw the Boer prisoners guarded by a British regiment which had surrendered to the Boers. A French Boer prisoner observed to the author that the British might thank their stars that they had had such stupid adversaries as the Boers, and the Boers that they had had such bungling opponents as the British. Our globe-trotters then *did* India in the usual way, the author remarking on arrival there "The first thing which strikes the traveller on reaching India is a peculiar smell, compounded of I know not what mixture of odours of tobacco perfumed with rose-water and naked bodies, which we may designate the specific perfume of India. It accompanied us through all the towns and villages up to the remotest corners of the north of the peninsula." The party travelled in special railway carriages placed by Government at the Grand Duke's disposal during his stay in India. They were "surprised at the extreme diversity of countries comprising the Indian continent, caused as much by the nature of the landscape as by that of the population, their races and religions. British

civilisation has not touched Hindoo traditions, and has nowise changed the natives' mode of life. Everywhere the Briton maintains the attitude of a master, and keeps the Hindoo at a distance. He troubles himself little to learn whether he is liked or not, and although he can never do without the native, he never tries to comprehend him or to penetrate his mind. If he has come to India, it is chiefly to make money; and, to tell the truth, he can do whatever he likes, on condition that he respects the beliefs, gods, and women of the Indians."

"While a 'people of India' does not properly exist, the British have established a reign of order and tranquillity, *pax Britannica*, and given to all the peoples of India a common language, English, which has become the official language of this immense empire, and is also the language of the intellectual Indians who discuss at their National Council the interests of their country. By allowing the natives to participate in the benefits of Western instruction—there are five universities in India—the British Government has fused the different parts into a great empire, and converted the different peoples into a sort of *nation* which may one day claim the right to participate more effectively in the government of the country." The events of 1909 fulfilled this prophetic note of 1902.

The travellers then proceeded to Singapore where the Grand Duke was received by the Governor "avec cette cordiale simplicité qui fait un des charmes de l'hospitalité anglaise." After visiting Siam and Indo-China, the party reached Japan where the Emperor invested the Grand Duke with the Grand Cordon of the Order of the Chrysanthemum, a decoration given only to princes. Eventually they sailed to San Francisco and found few traces of the earthquake of 1907. They considered the climate "un des plus merveilleux du monde," and envied the "heureux habitants de Frisco." The author declares he knows no city equal to it for beautiful women, many of whom have Spanish or Mexican blood, yet a healthy Anglo-Saxon complexion. After a visit to the magnificent forests and "big trees," the travellers proceeded to Chicago, where they found a very great number of Russian working men and a Polish cathedral with seventeen dependent churches. The author says Chicago is called the "windy city" because of perpetual wind. He found that Sunday is strictly observed, and that, although family and home life are greatly appreciated, "les États-Unis n'en sont pas moins la terre classique du divorce." A visit to New York and Newport and a return to France conclude a well-written and, we may add, a well-illustrated volume.

The Teaching of Geography. By L. W. Lyde, M.A., Professor of Economic Geography in University College, London. London: Blackie and Son, Ltd., 1909. *Price* 1s. *net.*

Professor Lyde has had a great deal of experience in the teaching of Geography in schools, and thus anything he has to say on the subject is interesting and instructive to teachers. He has gathered together in this little volume his lectures to the Summer School for Teachers in the University of St. Andrews. We cordially agree with most of Professor Lyde's views. To begin with the known, to employ first-hand observation, to proceed as in house-building by laying stone to stone, are fundamental principles. Every teacher worth his salt has a definite scheme for the Geography work of the school based on some such foundation. To throw unconnected snippets at pupils is a sure means of creating indigestion.

At the beginning of the book the author gives an opinion with which we do not agree, and which he himself implicitly abandons later on. He says that there is no need in schools for Geography specialists. "What the particular teacher must be a specialist in is teaching, not Geography." Of course, a teacher must be a *teacher*;

otherwise, what is he? One does not usually employ a baker to lay carpets. Surely a headmaster who asked a man with Honours in Science to teach classics would be suspected of softening of the brain. Possibly Professor Lyde means that a "specialist" is a man who cannot teach. Farther on he confesses that one of the things that hampered him at the beginning was his own ignorance. It seems clear that the more that ignorance was diminished the more of a specialist he became. Obviously it would be more satisfactory in every way to start right off with a "specialist"—who would also be a teacher of course, a word which means, we think, a person who is able to teach—than to waste a few years in trying a man to see if he could make himself a specialist. Besides implying that a specialist cannot teach, Professor Lyde says that the teaching of Geography in a school would not occupy the whole time of one man, and therefore the authorities could not afford to employ one. The author's ideas as to the amount of time required are rather contradictory, for on page 14 he seems to have been satisfied with "45 minutes a week with each class in school, and about 20 minutes for home work," and on p. 86 he says:—"I had really very little time—only 45 minutes a week with each class." Now if that time is doubled—which is the usual allowance—there is ample work for one teacher in a school of reasonable size—say four hundred pupils.

There are other obvious contradictions; for instance, the first sentence on page 16 and that on page 40, all of which go to show that the author has not put his usual carefulness into the preparation of this little treatise.

The Face of the Earth. By EDWARD SUESS. Translated by HERTHA B. C. SOLLAS. Under the direction of W. J. SOLLAS. Vol. IV. (iii. 11 of the German Edition). Oxford: The Clarendon Press, 1910. *Price* 25*s. net.*

This additional volume of Dr. Hertha Sollas' admirable translation contains numerous illustrations, but the plates are absent and are to appear with the complete index in vol. v. We reserve any general discussion of the English issue the appearance of the final volume.

Travel and Exploration. Vol. I., January to June, 1909. Vol. II., July to December, 1909. London: Witherby and Co.

The first two (bound) volumes of this interesting new magazine have been sent to us, and in this form the magazine increases the impression which the monthly parts have given, that it fills admirably a gap which has hitherto existed between purely popular and purely scientific journals. The articles are mostly excellent, and are well-illustrated, and should tend to increase the love of earth-lore among the members of the general public.

BOOKS RECEIVED.

Egypt and the Egyptians: Their History, Antiquities, Language, Religion, and Influence over Palestine and Neighbouring Countries. By the Rev. J. O. BEVAN, M.A., F.G.S. With a Preface by Sir GEORGE H. DARWIN, K.C.B., M.A., LL.D. Crown 8vo. Pp. xxii+324. London: George Allen and Sons, 1909. *Price* 5*s. net.*

Labrador: The Country and the People. By WILFRED T. GRENFELL, C.M.G., M.R.C.S., M.A. (Oxon.), and others. Crown 8vo. Pp. xii+497. New York: The Macmillan Co., 1909. *Price* 10*s. net.*

The Land of the Golden Trade (West Africa). Romance of Empire Series. By JOHN LANG. With 12 Reproductions from Original Drawings in Colour, by A. D.

M'Cormick. R.I. Square 8vo. Pp. ix + 310. London: T. C. and E. C. Jack, 1910. *Price* 6*s. net.*

Borneo: The Land of River and Palm. By Eva Green. With a Preface by the Lord Bishop of Labuan and Sarawak. Crown 8vo. Pp. xvi + 170. London: Borneo Mission Association, 1910. *Price* 2*s. net.*

Die Kultur der Araber. Von Dr. Joseph Hell. Crown 8vo. Pp. 144. Leipzig: Quelle und Meyer, 1910. *Preis* 1.25 *M.*

L'Empire Japonais et sa vie économique. Par Joseph Dautremer. Demy 8vo. Pp. 308. Paris: E. Guilmoto, 1910. *Price* 6 *fr.*

Portuguese Self-Taught. (Thimm's System.) With Phonetic Pronunciation. By E. da Cunha. Crown 8vo. Pp. 120. London: E. Marlborough and Co., 1904. *Price* 2*s.* 6*d.*

Greek Self-Taught (Modern). With Phonetic Pronunciation (Thimm's System). By Nicolaos Anastassion. Crown 8vo. Pp. 120. London: E. Marlborough and Co., 1904. *Price* 2*s.* 6*d.*

Motoring in the Balkans along the Highlands of Dalmatia, Montenegro, the Herzegovina and Bosnia. By Frances Kinsley Hutchinson. Demy 8vo. Pp. xiii + 341. London: Hodder and Stoughton, 1910. *Price* 12*s. net.*

Excursions Botaniques en Espagne au Portugal. Par Robert Chodat. Pp. 132. Geneva: Eugène Froreisen, 1909.

A Transformed Colony: Sierre Leone as it Was and as it Is: Its Progress, Peoples, Native Customs, and Undeveloped Wealth. By T. J. Alldridge, I.S.O., F.R.G.S. With 66 Illustrations and a Map. Demy 8vo. Pp. xvi + 368. London: Seeley and Co., Ltd., 1910.

Researches on Ptolemy's Geography of Eastern Asia (Further India and Indo-Malay Peninsula). By Colonel G. E. Gerini, M.R.A.S. Asiatic Society Monographs, vol. i. Published in conjunction with the Royal Geographical Society. Demy 8vo. Pp. xxiv + 945. London: Royal Asiatic Society, 1909.

Our Present Knowledge of the Fauna of the Forth Area. By William Evans, F.F.A., F.R.S.E. Crown 8vo. Pp. 68. Edinburgh: M'Farlane and Erskine, 1909.

Au Chad. Trois ans chez les Senoussistes, les Ouaddaiëns et les Kirdis. Par Capitaine Cornet. Une vol. in-16. Pp. 326. Paris: Plon-Nourrit et Cie, 1910. *Prix* 4 *fr.*

Fighting the Slave-Hunters in Central Africa: A Record of Twenty-Six Years of Travel and Adventure round the Great Lakes. By Alfred J. Swann. With an Introduction by Sir H. H. Johnston, G.C.M.G., K.C.B. With 45 Illustrations and a Map. Demy 8vo. Pp. xvi + 359. London: Seeley and Co., Ltd., 1910. *Price* 16*s. net.*

Neuvième Congrès International de Géographie. Compte Rendu des Travaux du Congrès. Par Arthur de Claparède. Tome Premier. Geneva, 1909.

Meteorological Observations in Perth, 1856-1908. Pp. xvi. Perth: Perthshire Society of Natural Science, 1910.

Report of the Chief of the Weather Bureau, 1907-1908 (U.S. Department of Agriculture.) Washington, 1909.

A List of Geographical Atlases in the Library of Congress, with Bibliographical Notes. (Library of Congress.) Vol. i., Atlases; vol. ii., Author's List; Index. Washington, 1909.

Wörterbuch der Deutsch-Japanischen Umgangssprache. Von A. Seidel. Lief. i. Pp. 48. Berlin: Märkischen Verlagsanstalt, 1910. *Preis* 1 *M.*

Publishers forwarding books for review will greatly oblige by marking the **price** *in clear figures, especially in the case of foreign books.*

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

THE GEOGRAPHICAL RELATION OF THE MARKET TO THE SEATS OF INDUSTRY.[1]

By Geo. G. Chisholm, M.A., B.Sc., Lecturer on Geography in the University of Edinburgh.

The best market is the market on the spot. Like most general propositions that is a statement in need of qualification or at least explanation, but it is one that answers to the truth well enough to make it a convenient starting-point, and the necessary qualifications may be left to emerge as we proceed. By way of illustrating my opening proposition, I may take the leading, or at least one of the leading, industries of Edinburgh, that of printing. I remember on one occasion, through the accidents of travel, having a conversation with one of the principal printers of the city, who explained to me the important position that Edinburgh enjoyed in his trade. He said it was essentially due to the presence of the law courts. When the courts are sitting a great deal of printing has to be done, and much of that on very short notice. The consequence is that all those who share in this business (at the time of this conversation, some fourteen or fifteen years ago, only five firms, according to my informant) had to keep a much larger staff than can be constantly employed on legal business, so as to be ready for emergencies. This urgent work is necessarily highly paid. I suppose at all times and in all countries the administration of the law is carried on on the assumption that litigants are well able to pay. At any rate they must pay. Thus a certain number of Edinburgh printers with this lucrative market on the spot are able to increase their profits by estimating for publishers' printing whether for Edinburgh, London, or elsewhere at an exceptionally low rate. In slack times they turn their

[1] A paper read to the *Scottish Society of Economists*, Feb. 17, 1910.

men on their less urgent work, which is put aside when the urgent orders for legal business come along. While thus the very paying local business secures for them the bulk of their profits, it enables them to obtain indirectly relatively smaller additional profits, and when once a business is made to pay, no additional profit, however small, that enables it to pay better is despised.

This illustration may serve at once to make clear some of the advantages of a local market, and also to show how it is that in spite of the superiority of the local market, established businesses seek to push their way into more distant markets, how in fact those more distant markets may even be necessary to enable them to reap the full advantage of the market on the spot. It furnishes, therefore, an example of one of the necessary qualifications of my opening proposition.

In beginning as I have done, I may seem to some of you to have plunged, like epic poets, *in medias res*. I did so in order to give at the outset some idea of the nature of my subject, which I found was rather puzzling to some to whom I mentioned it. It will be observed that by the market I mean not a market in any technical sense, but simply the body of purchasers or consumers of the products of any industry, or the main body or bodies of such consumers wherever they may happen to be.

But to deal with my subject profitably I must proceed a little more systematically. My aim is to see whether and how far the position of the market (or markets) throws light on the situation of industries, it being understood as regards the "how far" that in this as in other similar geographical inquiries we have no means of measuring the precise amount of any influence. We can only arrive at some rough indication of the relative importance of different influences.

With a view to this more systematic treatment of my subject, as soon as I adopted it for the paper which at the request of the honorary secretary I had agreed to read to this Society, I determined to procure a copy of a book, whose title I had previously noted, on the Localisation of Manufacturing Industry,[1] by one Alfred Weber. True, my subject is not the localisation of industry, but only one factor in that localisation, but I felt sure it was one that Mr. Weber could not overlook. Accordingly I got his book, and verily I found it systematic enough. To begin with I found that it was only the first part of a work the second part of which is not yet published, and this first part deals only with "the pure theory of the localisation of industry," in which the author confessedly pushes abstraction to an extreme. One is asked to assume this and assume that, to ignore this and ignore that, until one almost feels that one is asked to ignore all the essential elements of the problem. One is tempted at times, like the author himself, "to wish all this love of pure theory to the devil," but yet as one reads on (no easy matter) one begins to see that there is a penetrating understanding of concrete fact behind all this subtle systematising,

[1] *Ueber den Standort der Industrien.* Von Alfred Weber. *Erster Teil: reine Theorie des Standorts.* Tübingen (Mohr), 1909.

and I for one am disposed to look forward with eagerness to the appearance of the second part of the work, which is to deal with the facts of the industrial development of Germany since 1860, and which, we are told, is practically ready except in so far as it will be necessary to take note of the data[1] of the new German industrial census of June 1907.

I was right at least in assuming that Mr. Weber could not fail to take into account the situation of the market in his study of the localisation of manufactures, for in his first analysis of the conditions determining the seats of such industry in any region or district he comes to the conclusion that so far as a region is concerned, one has to consider the operation of only two general factors, the costs of transport and the cost of labour, and the costs of transport are, on the one hand, those incident to the procuring of the materials made use of in the manufacture, and, on the other hand, those involved in conveying the finished article to the consumer. Starting from the assumption that an industry tends in the first instance to be drawn to the spot where the transport costs are most favourable, one may regard the best conditions as regards labour costs as a cause tending to a deviation from that spot, and these are the only factors that have to be taken into account as affecting seats of industry in country districts where the differences in the cost of land are not of sufficient moment to influence the choice of a locality. It is otherwise, however, in densely populated centres. But the causes that tend to bring about such centralisation, or as the author calls it, agglomeration, may be regarded as another deviating factor. Besides these three there are no other general factors that regulate the distribution of manufacturing industry.

Such are the fundamental ideas, the full content of which Mr. Weber proceeds to develop. Now I admit that this comprehensive method of treatment is the only method by which the subject I have chosen can be adequately treated. There can be no satisfactory indication of the part played by the local market in determining the seats of industry without reference to the other factors concerned. I am sorry, nevertheless, that I am unable on the present occasion to treat the subject on Mr. Weber's lines. I doubt whether it would be possible to set forth and apply his point of view in a brief lecture. And if that is possible I cannot do it. I am not gifted with that quickness of insight which would be necessary to enable one to master his treatment of the subject at a single reading, and I have not yet had the time to give his book that amount of patient thought which, I have already indicated, it seems to me to deserve, and which it undoubtedly demands. The author himself admits that it was written "with renunciation," and must be read with renunciation. I must, therefore, content myself with a humbler performance. I have said above that I must proceed *a little* more systematically than I did at the outset. But I promise no more. All that I propose to do is to offer in a more or less natural and orderly sequence a number of instances of diverse ways in which the

[1] Revised figures published in 1909.

market is related to the seat of industry, rather an enumeration of cases to be studied than any professed study of them. This method of treatment will at least be easier to follow than any attempt to handle the subject in a more abstract and systematic manner.

I will begin with some further examples of the same kind as that with which I opened this address, the influence of a market in a particular district as promoting the growth of a local industry. A noteworthy illustration of this influence is shown by the rapid growth of cotton manufactures in the southern states of America. About five months ago I was talking to one of the largest cotton-spinners and weavers of those states, and I was struck by the emphatic way in which he affirmed that the negro had been the making of that industry. I was struck with it because I knew that it was not as a worker in the mills that the negro had had any such effect. What was referred to in this remark was the negro as the purchaser of the manufactured goods. No doubt there are other contributory causes to the building up of that industry as the manufacturer in question well knew, but this was the one on which he laid most stress. And it may be noted as an illustration of the effect of this cause that this industry is not a highly concentrated one in the southern states of the Union as it is in Lancashire, but is widely scattered over the large agricultural area where the purchasers are found. Perhaps an even more striking instance is the cotton industry of Japan, which has not grown up on the Japanese coalfields but in the most densely peopled part of the country. Among other illustrations of the obvious influence of a local market in developing industry are the manufactures of agricultural machinery in the eastern counties of England, of similar machinery in the centres most conveniently situated with reference to the agricultural districts of America, such as Chicago in the United States, Toronto and Hamilton in Ontario, and even in the young city of Portage la Prairie in Manitoba, where large works of the kind have been established; further, manufactures of sugar-beet machinery in Prussian Saxony, of dairying machinery in Denmark, of mining machinery at Castlemaine, Ballarat, and Melbourne in Victoria, as well as elsewhere in Australia, of tin-plate not merely at the great iron centres of the United States, but also at many places scattered over the agricultural areas of that country.

In the case of manufacturing industries, towns in the newest parts of new countries are peculiarly fitted to illustrate the effect of local demand in calling such industries into being. Such towns are under some obvious disadvantages in starting manufactures; still manufactures of some kind very speedily grow up, and it is interesting to observe their nature. I take as examples the manufactures of Calgary and Edmonton as they are enumerated in little handbooks distributed to the members of the "western excursion" after the Winnipeg meeting of the British Association last year. The list is naturally longer in the older and more populous of the two towns, Calgary. According to a police census taken on June 19, 1909, its population was then 29,265 as against a population of 23,000 to 25,000, at which that of Edmonton was estimated about the same time. I begin accordingly with Calgary, enumerating its

manufactures in alphabetical order as given in the Calgary handbook. They were ale and beer, biscuits, boxes, breakfast foods, bricks, beds, building materials, confectionery, cigars, cement, ground coffee and spice, electric light and power, flour, gas, iron and metal work, lumber, leather goods, including harness and saddlery, mattresses, maccaroni, meat products, soap, show-cases, tents, temperance drinks, and wagons. Ale and beer, bricks (as well as tiles), cigars, flour, iron work, lumber, mattresses, meat products, and tents are all found also in the Edmonton list. The sash and door factories of Edmonton probably produce the same kind of building materials as those referred to under this latter head at Calgary (bricks, cement, and lumber being separately enumerated), and the concrete works of Edmonton may be set over against the cement works of Calgary. Now in most cases the immediate relation of the industries mentioned to the local market is too obvious to need any comment. In a few cases, such as the preparation of breakfast foods, maccaroni and meat products, and the sawing of logs into lumber, the local supplies of raw material must of course be also taken into account in explaining the industries, and will probably tend to widen the market for the products of those industries, but even in their case the local market will probably be the chief influence in determining the magnitude of the industry. For the lumber manufacture Edmonton has much greater advantages in the form of local material than Calgary, which is not situated in a timber-growing district, but in this case the local market tells in a manner that will be readily understood by those who have witnessed the enormous waste that goes on in the far west where there is no local market for the refuse of this industry, the waste pieces of wood pouring down in a constant stream on a fire which is maintained for and by their consumption.

The presence of a cement industry at Calgary but not at Edmonton is also largely accounted for by its situation with reference to the bulky, raw materials employed in its manufacture, coal, limestone, and clay. Coal is obtainable at no great distance to the west at the base of the Rockies on the main line of the Canadian Pacific Railway, on which Calgary also is situated. The limestone comes from a point about 50 miles west of the city, and the clay from a point 22 miles south on the M'Leod line, which may also bring in coal from Lethbridge. At the time when the cement works were started, in the summer of 1906, the price of Portland cement at Calgary ranged from $4\frac{1}{4}$ to $4\frac{1}{2}$ dollars per barrel. It was expected that the new company would place it on the market at 3 dollars per barrel, but whether that expectation has been realised I have not learnt.

Among the manufactures carried on both at Calgary and Edmonton it may seem surprising to find cigars mentioned. No doubt the local market accounts for the consumption of large numbers of cigars in and round both places, but then cigars are very easily transported from places where they can be manufactured in much greater quantity under much more favourable conditions. But with reference to this industry an observation of Weber's is in place. He says: "Unmixed materials (that is materials which enter completely into the finished product) can never

attach the industry to the place where those materials are found,"[1] for in such cases, even if weight alone were taken as determining the cost of transport, the weight of the finished article that has to be carried to the market is at least as great as that of the raw material. Apply this to cigars. The warehouse containing the manufactured tobacco may be taken as the place where the raw material is found. This manufactured tobacco, if it does not enter wholly into the manufacture of cigars, will at least enter wholly into products that are sold by the factory. This observation of Weber's will, I think, be found to throw light on several of the other industries common to Calgary and Edmonton.

In further illustration of the way in which a local market promotes manufactures one may refer to a crowd of subsidiary industries for which the primary industry forms the market. Thus the printing industry of Edinburgh requires paper and printers' ink, both of which have long been manufactured in the district. Paper requires paper-making machinery, an essential part of which is wire-gauze, one of the largest works for the production of which exists at Leith. But paper in great quantity is an obvious requirement of every dense population in an advanced community, and as the materials and the product are both heavy and bulky it is, of course, advantageous to carry on the manufacture in the neighbourhood of any such populations where the other necessary conditions can be obtained. Hence the old and large manufacture on the rivers of Kent, and the still larger manufacture in south Lancashire, the most densely peopled area outside of London, and it is in Lancashire that practically all the felting required in the drying of the paper is manufactured. The manufacture of machine-tools is essentially a subsidiary industry, and hence for the heavier tools of that kind the chief centres in England are Manchester, Leeds, and Sheffield, while the lighter kinds of tools are made chiefly in the district round Birmingham, where they are most required for the various local metal trades chiefly concerned in the supply of metal wares for the house and the shop, trades which have likewise given rise to the subsidiary industries of japanning, lacquering, and enamelling. But to multiply illustrations under this head is needless.

In the case of machinery the value of the local market is frequently determined by the wages of labour. Hence it is that many British inventions have first been rendered effective in America. The sewing-machine was, it appears, invented and patented in England as far back as 1790, but it was first effectively introduced by Howe in America, and was essential to the introduction of boot-making machinery in the same country, which has been the place of origin of nearly every other machine connected with the same industry.[2] The Northrop automatic loom was likewise an English invention, and so too was the first coal-cutting machinery, though both of these have received by far the widest

[1] *Standort*, pp. 61-2.

[2] The one important exception is said to be the clicking or upper-cutting press, which was an English invention.

application in America, the first indeed having been extensively used in that country before it was adopted in this country at all. In neither case, however, was the relative cost of labour the sole reason for the earlier introduction and wider use of the respective machines in America, the Northrop loom being better adapted to the production of the tissues mostly woven in the States, and the seams of coal at present worked in America presenting greater facilities for the use of coal-cutting machinery than most of those in our own country. In the highly contorted anthracite field of Pennsylvania coal-cutting machinery is not used at all.

An interesting local cause of a different kind of the transference of an invention in the opposite direction is presented in the history of high-speed steel. This is an American invention. The very name indicates that it is used for tools working with extreme rapidity, but the more solidly constructed British tools stand the strains caused thereby better than the lighter and weaker tools of American make, in consequence of which "high-speed steel has vindicated Sheffield, which is without a serious rival in its production."[1]

In connection with the paper industry I have already incidentally given an illustration of the influence of the weight and bulk of the materials and product tending to the utilisation of materials near the market where such were obtainable. Another illustration is afforded by the cement industry, above all in new countries where rapid expansion brings about a great deal of heavy building, and creates a large demand for cement. Hence it is that cement plants are widely scattered over Canada from the St. Lawrence to the Rocky Mountains, and it may be added that it is in connection with such heavy products that one of the most important economies arising from the conclusion of working agreements and the formation of trusts is effected. Last year a company with a capital of upwards of £6,000,000 was formed to unite and control a number of cement plants distributed over the area mentioned, and one object of the formation of the company is "to eliminate the present excessive freight charges by distributing from the plant nearest the demand of the consumer."[2] For similar reasons in 1904 or 1905 the makers of ship-plates in Scotland and the north-east of England came to an agreement not to sell in each other's district, while at the same time the four English firms that roll steel angles had (perhaps still have) an agreement to the same effect among themselves.[3]

Very populous centres have a peculiar attraction for industries concerned with the production of finished products, especially of the kind that are in universal consumption, and are rapidly consumed, and involve great transport, including handling costs. Dr. Shadwell remarks that chance settled the boot-making industry in London,[4] but I am disposed to think that whatever may be true as to the original settlement, some-

[1] Shadwell, *Industrial Efficiency*, cheap edition, 1909, p. 669.
[2] *Monthly Consular and Trade Reports*, U.S.A., No. 350, p. 159.
[3] Sir Charles McLaren in the *Times, Engineering Supplement*, No. 12, p. 95.
[4] *Ibid.*, No. 143, p. 3.

thing more than chance had to do with its growth there. Boots can be delivered from the London factory direct to the retail shop, whereas if they are manufactured out of London there is all the cost of carriage into London and handling at the London terminus, in addition to the cost of delivery. The great development of the industry in the Midlands shows indeed that this is not a decisive consideration, but if there is some force in the observation just made with regard to the London boot trade, there is manifestly much greater force in it as applied to such rapidly consumed commodities as biscuits, jam, and pickles. On the other hand what has just been said does not apply to commodities like soap, crockery, butter, and cheese, in the making of which a large proportion of material not included in the final product is employed.

The importance of the market is one great reason why at all times manufacturing industries have been largely pursued at great centres of trade. Such centres have, as is implied in this very description, peculiar facilities for reaching diverse markets, and these facilities are in many cases enough to make up for a number of disadvantages. It was such facilities that made Tyre and Sidon in ancient times great seats of varied manufactures, in later days Alexandria, and still later Venice, Florence, and Milan, Cologne, Augsburg, Nuremberg, Bruges, and Ghent. In this connection I may quote an observation of Weber's that in the inductive (still unpublished) part of his work it will be shown that "the necessity for the agglomeration of industries on and round the coal-fields is for the most part greatly overestimated."[1] The continued importance of Augsburg and Nuremberg as manufacturing towns may serve as an illustration of this remark, as well as the fact already referred to as to the situation of the cotton industry of Japan; but probably no country offers a more striking illustration of it than the United States. A few years ago I had or took occasion to mark on a map all the counties of the United States which in 1904 produced as much as 100,000 short tons of coal, and I found that there were only three towns which by the census of 1900 had a population exceeding 100,000 situated in counties producing coal, only two indeed if we reckon Pittsburg and Allegheny as one, which they are geographically. The other is Scranton in the Pennsylvanian anthracite district. The most productive coal-fields are in the Appalachians. The manufacturing towns are on or near the eastern seaboard where the population is, or are towns which owe their importance primarily to commerce.

I have on another occasion[2] tried to show that the world-wide commercial relations of Great Britain are an essential part of the explanation of the remarkable predominance of this country in the cotton industry, and it seems to me that the same is true of the Irish linen industry. The best flax in the world is produced round Courtrai. Courtrai carries on a linen industry of its own, but uses none of its own flax. It manufactures coarse linens suited to its local market with flax obtained from Russia. The chief market for Courtrai flax is Belfast,

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[1] *Standort*, p. 162.

[2] See *Geog. Jour.*, xviii. p. 427.

which has the advantage of being able to disperse its fine linens over the world by means of the ports of Liverpool and Glasgow.

The two textile industries that I have just mentioned may serve as an illustration of the fact that the very magnitude of an industry is in one way or other an aid in extending its market to widely distant regions, and of that numberless other illustrations might be adduced. English cotton-spinning machinery goes everywhere. Canadian agricultural machinery goes largely to Australia and India, that of the United States reaches the same markets and predominates even in Siberia. Siberia derives machinery connected with the dairying industry from Denmark. No doubt the magnitude of India's local market for her own yarns contributes greatly to her successful competition with Japan in supplying the markets of China with this commodity. An experiment is at last about to be made in the commercial production of beet-sugar in England from English grown beets which presents several points of interest in connection with our subject, among others one under the heading now being considered. A company has been formed[1] to make the sugar. Arrangements have been made with farmers in the neighbourhood of Sleaford, Lincolnshire, where the factory is to be erected, to grow about 2000 acres of beet annually for five years. They therefore will have an assured local market for their product. The prospectus of the company rightly points out that "the market for the sugar should be almost at the door, as the neighbouring large towns should be able to absorb all that can be made." For the machinery, however (and that is why I introduce this instance here) the company has to go to Germany—to Grevenbroich in the Düsseldorf district of the Rhine Province.

In recent times improved means of communication, and still more recently improvements in the methods of preserving perishable commodities, have also been important means of extending the market, but this fact is so familiar that it hardly needs illustration. Still under the latter head it may be worth while to mention that "in 1908 a consignment of Kootenay strawberries, after being properly cooled, were shipped a distance of no less than 3000 miles, and arrived in good condition."[2] From the same authority I quote an illustration of the way in which the market may be extended by organisation and honesty. "The apple-packers of the Hood River Valley, in the State of Oregon, acting under the strict regulations of the Hood River Apple Growers' Union, have brought their art to such a pitch of perfection, and work on such a standard of integrity, that thousands of boxes of Hood River apples are bought by wholesale houses in New York and other large Eastern American cities without their ever seeing or examining a single box, or even a single apple." The local prices, moreover, have been greatly increased. In four years the price "for the best grade of Spitzenbergs" was increased more than threefold.[3]

[1] I was sorry to learn after this was written that the company failed at the first attempt to raise the necessary money, but I trust that the starting of the industry is only postponed for a short time. In any case the project may serve to illustrate my point.

[2] *Fruit Ranching in British Columbia*, by J. T. Bealby, M.A., p. 101. A. and C. Black, 1909.

[3] *Ibid.*, pp. 156-7.

The influence of the magnitude of a business as a means of extending the market for its products makes it important to note where any large country, as a whole, has special advantages in connection with any particular industries. A peculiar stimulus was imparted to the German iron and steel industries in the seventies of last century by the fact that the extraordinary deficiencies in the means of communication in that country then began to be made good, with the result that a varied industrial development, for which those improved means of communication were necessary, was set agoing with remarkable rapidity. The development of iron and steel shipbuilding gave a similar stimulus to the corresponding British industry—checked, however, by the partial loss of foreign markets where local industries were growing up. The need for new railways, iron and steel bridges, agricultural implements, and machinery of all kinds, structural steel, etc., has had a like or rather much greater effect on the American industries. To multiply examples is needless, but it may be pointed out that this consideration furnishes one of the strongest arguments of the tariff reformers of this country. If a great home industry is itself a means of extending the market to other countries, that industry is likely to be strengthened as an invader when the home market is kept secure or nearly secure by a customs barrier.

For export trade a position on the seaboard, or more precisely at or in the vicinity of a good seaport, gives great advantages for reaching a great variety of markets. As all our foreign trade is necessarily by sea such a situation is peculiarly advantageous for export trade. That also is a commonplace, but it may nevertheless be pointed out that this in some cases has had the effect of changing the seats of certain factories working largely for export to the seaboard, and where the same industry is carried on at inland and coast centres, it is the latter naturally that do most of the export trade. Thus Manchester, Leeds, and Glasgow are all important seats of the manufacture of locomotives, but it is Glasgow that takes the lead (I understand a decided lead) in the export trade.

But though any favourable situation with reference to the sea has the advantage indicated, and though sea-freights in many cases are largely determined by other circumstances than distance, still the distance of a market by sea counts more or less in trade competition. Japan is finding her best markets at her own doors, just as the United Kingdom finds some of her best markets there. Even Japanese cotton machinery is being introduced into southern China. Japan is now important in the Australian silk trade, and is making a good start in the same market in cheap cottons. Japanese cotton hosiery is finding a rapidly growing market in India. The same market has long taken considerable quantities of Italian cheap cottons, and here again I have no doubt that the trade is considerably assisted by the fact that Italy is nearer the market than her European rivals.

But, further, in connection with sea-borne commerce I must once more insist on the fact that the sea gives us no advantage in the case of markets that may easily be reached from inland centres of production. This is a matter I have also dealt with in the paper I have already

referred to.[1] I will not repeat what I have there said with special reference to the relative advantages of the United Kingdom and the United States for trade with Canada and Mexico. I will merely say that I have there pointed out the advantages accruing to the United States, above all, in trade with western Canada through the shorter railway distances that have to be traversed, and that the transport can take place without break of bulk, through the fact that Canada can be more easily visited by commercial travellers from the United States than from this country, and through the similarity of tastes and needs in the two countries arising from similarity of climate and of economic conditions. Here I may add one or two other indirect effects of this contiguity. Where rather elaborate machinery or plant of a kind that Canada cannot supply for herself has to be erected in that country, even though that machinery or plant might be supplied more cheaply by Great Britain than by the United States, the latter country is nevertheless likely to get the preference for two reasons: first, because the order can be executed there more promptly: but, second, what is much more important, because if anything goes wrong and the manufacturer has to send some one to see what is wrong and put things right, that can be much more easily and quickly done from the United States than the United Kingdom.

Then, further, the rapid development of Canada now going on is bringing about a great influx of so-called Americans[2] into both eastern and western Canada. In western Canada they are largely farmers who, when they want agricultural implements, wire-fencing, or other imported goods, are likely to order them from the firms with which they are already acquainted. If, as in eastern Canada, they are workmen and captains of industry, they promote business connections with firms in the United States in other ways. Through their influence, it is said, the building trade of Canada has been made to conform in a large measure to American practice. Hence the shapes of structural steel required in Canada are the same as those in the United States, but different from those in the United Kingdom. British mills are, it is said, unable to cut the shapes required in Canada, and the Canadian market is not big enough to make it worth while to go to the expense of cutting special rolls for the trade.

These considerations make it doubtful whether a recent criticism of Dr. Shadwell's on one branch of British industry is altogether pertinent. Speaking of the machine-tool trade, he says that "it owes much to the [United States] and has learnt the lesson so well that it is now ahead in efficiency if not in show. What it lacks is imagination and a real appreciation of the value of ideas. It has not yet discovered that a great field is open in Canada, which is swamped by American machines."[3] It may be that it appreciates very well the extent of the field, but

[1] *Geog. Jour.*, xviii., pp. 429-32.

[2] This term may be allowed to pass as meaning people belonging to the United States, for Canadians at least repudiate almost with indignation the name of Americans for themselves.

[3] *The Times, Engineering Supplement*, No. 158 (March 4, 1908), p. 3, col. 3.

likewise has a just appreciation of the nature of the barriers that shut it out from a large part of it.

The recent history of the external trade of Canada is a speaking commentary on the superior advantages of the United States for reaching that market. Since the granting of the first preference tariff to the United Kingdom (August 1, 1898) the percentage of dutiable goods imported from the United States cannot be said to have declined. It is true that in the very first year of the preference there was a drop from 51 per cent. to 49·7 per cent., but then the 51 per cent. was a sudden rise from 46 per cent. in the previous year (1896-7), a rise which may have been largely due to the desire of United States manufacturers to push their trade as much as possible before they were placed at a relative disadvantage. In any case the percentage has never fallen again to the figure of 1896-7: never, indeed, except in the year 1898-9 below 50. True, the British percentage of those goods has ceased to decline, as it had been doing, and has latterly even shown an advance (in 1907-8 32·6 per cent., as against about 30 per cent. in previous years of the preference). The countries that show a decline since the preference are those which are under the same disadvantage as regards transport as the United Kingdom.

When we look into details we find that they are of such a nature as might be expected when we consider the relation to the market in the case of the two chief competitors for Canada's trade. Among manufactured goods (mainly dutiable) the chief heading under which the United States showed a decided superiority over Great Britain in 1907-8 was metals and manufactures thereof. The value of such goods imported from the United States was more than three times as great as the value imported from the United Kingdom (rather more than 57 million dollars against less than 19). If we take iron and steel and their manufactures separately the ratio is about the same—46 million dollars against 15. The two chief headings under which Great Britain is greatly in advance of the United States are cottons (12¼ million dollars from Great Britain against 2¼ from the United States), and woollens (nearly 18 million dollars from Great Britain against only 700,000 from the United States). A ton of cottons or woollens is probably, on the average, nine or ten times the value of a ton of iron or steel manufactures, so that any extra cost arising from the carriage of these is easily made good by the superior advantages of the British in manufacture, not to mention the benefit of the preference. Moreover, the market for cottons and woollens is more directly in proportion to population than that for iron and steel manufactures, and in the case of Canada the populous market is that which in great part at least is most accessible to British trade. The thinly populated west is not easily accessible to British trade, but affords a disproportionately large market for the products of the iron industry.

And here I want to repeat deliberately on the strength of the facts just set forth what I have already said casually to this Society, that one effect of the granting of a preference of two shillings a quarter to British-grown wheat would be, in my opinion, to impart a decided stimulus to the export of manufactures from the United States to Canada, so as to

bring about a growth of the percentage of the imports of such goods by Canada from the United States at the expense of the ratio derived from the mother country. As I stated on the occasion referred to, I do not think that such a preference would make much difference to us as consumers. The annual consumption of wheat here is a good deal less than a quarter per head, and I am disposed to think it unlikely that the consumers in this country would have to pay, in the first instance at least, the whole of the supposed import duty of two shillings on foreign-grown wheat. But though this two shillings might make little difference to us, it would be something substantial for the farmers of Canada. Whatever its effect might be on the price of wheat in the world-market, the full differential effect of the impost would be enjoyed by the wheat-growers of the British Empire. It will be understood that in saying this I am not venturing to make any prophecy as to the price of wheat after the subjection of foreign-grown wheat to the duty referred to in the British market. Too many factors enter into the determination of the price of wheat for any such prophecy to be justified. All that I mean is that whether the price of wheat remains the same, rises or falls, the producer in the north-west of North America will be better off by two shillings per quarter north of the forty-ninth parallel of latitude than south of that line. To put the matter concretely, that implies that in Canada as compared with the United States there would be an advantage of £12, 10s. in the case of any farmer having the produce of 50 acres of wheat at $2\frac{1}{2}$ quarters to the acre to sell off his farm. The result would inevitably be to strengthen the current of emigration to the part of Canada offering at present the greatest advantages for wheat production, the part to which the current has for several years past been setting so strongly, the part least accessible to British trade and most accessible to American. And, further, it cannot be doubted that in the circumstances the American tributary to that current, already so considerable, would be greatly reinforced, thus adding a further stimulus to trade between Canada and that part of the United States which is contiguous to the Canadian North-west.

I do not suggest that this country would be any worse off on that account as regards its trade with Canada. So far as that trade is concerned I do not doubt that it would be much better off. Such a stimulus to the settlement of the Dominion would undoubtedly be a stimulus to British trade with the Dominion. All that I would indicate is that it would stimulate the trade of the United States with the Dominion still more, and probably (I think almost certainly) to such an extent that our proportion of the total trade would once more tend to go down while that of the United States would rise. But such a relative decline has nothing really serious in it. It is only what this country has been experiencing in its external trade nearly all the world over for decades back, that relatively to other countries we have been taking a lower position while absolutely our commerce from period to period has been steadily expanding in nearly every direction. While then I point out the consequence which I should expect from the imposition of a two-shilling duty on foreign with a corresponding

preference on colonial wheat, I do not urge it as any reason in itself against adopting that policy: only, if we are going to take that step, I think we should be quite clear in our minds as to the results to be expected from it. I would add that the considerations here set forth ought to induce British manufacturers and merchants to take a special interest in the long-projected Hudson's Bay route to the Canadian North-west, of which an account is given in the February number of the *Magazine* by the most persistent advocate of this route, Dr. Robert Bell. There can be no doubt that Dr. Bell is right in thinking that when this route shall have been opened up "the people of Great Britain will soon learn that the increase in their own trade, which this route will afford, is a matter of much interest to them."[1] It is gratifying, therefore, to note that the Canadian Minister of Railways has been able to announce this year that the estimates will include a sum which will enable the construction of the Hudson Bay Railway to be begun.

From the nature of the argument used with reference to one probable effect of a two-shilling preference on British-grown wheat I may point out that it follows that wheat production in Australia and New Zealand would be equally stimulated by such a differential duty as we are supposing, and that in their case British trade would probably gain relatively more than in the case of Canada. The same remark may also be made with regard to South African wheat if the forecasts as to the results of the practice of "dry farming" in that part of the world come to be made good.

I have only one other observation to make before concluding. That is that where the influence of the local market seems sufficient in itself to establish an industry in a new country, the pull of the market is likely to become stronger and stronger as time advances. Among the things that hinder the development of manufactures in new countries are dearness of capital, lack and high price of skilled labour, and lack of population, but from the very nature of the case capital is likely to become cheaper, skilled labour is likely to become more plentiful and probably cheaper relatively to efficiency, and the population forming the market will certainly grow larger as the country develops. Unquestionably this is a consideration of far-reaching significance, but the discussion of its ultimate bearings is one that must be handed over to the economists.

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[1] Page 69 of article referred to.

THE DISTRIBUTION OF THE TOWNS AND VILLAGES OF SCOTLAND.[1]

By James Cossar, M.A.

1. Physical Aspects of the Question.

In discussing the physical aspect of the distribution of centres of population in any country three main factors, closely related to one another, must be taken into account; these are the configuration of the country, which is in a great measure a function of the geological formation, the climatic conditions, and the vegetation.

Certain land forms encourage human settlement, others render it difficult, if not altogether impossible. Generally speaking, a mountainous region does not offer favourable conditions for the permanent habitation of large numbers of people. The barren soil, the severity of the climate, the difficulties of communication and of social intercourse hinder human settlement; under such conditions trade is not possible, and without trade great centres of population cannot arise. To this general statement there are, of course, exceptions resulting from local or temporary circumstances. Not seldom have the bleak hills sheltered a nascent civilisation from invasion and extermination, while to-day the presence of vast stores of mineral wealth has fostered the growth of very considerable populations at high altitudes in the western part of the New World.

On the other hand, while there are lowland tracts, sometimes of vast extent, as in the northern parts of Eurasia and of Africa, where the population is of the scantiest, yet it remains true of temperate regions that the most densely populated areas are to be found in the lowlands, on the sea-board, across the plains, or along the river valleys that make their way into the heart of the country. Several factors contribute to make the lowlands the seat of thriving populations. The nature of the surface facilitates the tillage of the soil, while the climatic conditions are usually better adapted to successful agriculture than at higher altitudes. Thus it is that both the food of the people and the raw material of commerce are chiefly produced in the lowlands of the world. Moreover, the rivers of the plain are to-day a source of power as well as of transport, while in times past, besides furnishing the elements of life to the natives living on their banks, they played an important part in opening up the country by guiding the early adventurers into the interior. In a lowland district it is a comparatively easy matter to construct the artificial means of communication; and the rapid development of such an area is largely due to its roads, canals, and railways. Perhaps no better example of the superiority

[1] This article is based upon the Essay by the author which was awarded the Silver Medal offered by the Society for competition in the Class of Geography at Edinburgh University in 1909 (cf. vol. xxv. p. 669).

of the lowlands from this point of view can be found than the political and industrial history of our own country. "The Gael," writes Sir Archibald Geikie, "who long ages ago was pushed by the Briton into the mountain fastnesses of the north was left there to maintain, until only a few generations ago, his primitive habits, as hunter and warrior, cattle-dealer and freebooter. While he remained comparatively unprogressive, the Norsemen, Danes, and Saxons, who took possession of the lowlands that lay between his glens and the sea, were able to advance in agriculture upon richer soil and in a less inhospitable climate, and to crowd the land with their homesteads, farms, villages, towns and seaports." Elsewhere the same authority says: "It is the lowlands that have mainly contributed to the material prosperity of the country. In these more fertile regions have lain the chief elements of progress. The broad valleys and plains, eroded by the rivers and strewn with the soil carried down from higher grounds, have determined the sites of our principal towns, and the distribution of the great centres and belts of population. Our agricultural progress is the story of the exploration of lowland coal-fields and iron-mines. Our commercial progress is the story of the deepening of lowland rivers, the construction of lowland harbours, and the building of the network of lowland railways."

With the introduction of the elements of orderly government and the organisation of society upon the basis of marriage and the family, the need for a more or less permanent dwelling-place began to make itself felt. In the choice of a site whereon to rear their homes the founders of the earliest communities were influenced by two vitally important considerations. In the first place the situation of the settlement must be such as would furnish the means of subsistence within a convenient distance. To this demand for the elements of life is to be ascribed the early rise of many of the fishing hamlets that skirt the coast, while in the interior those spots that were most lavish in furnishing the fruits of the earth would first commend themselves to the early settlers. But an equally potent influence in the choice of a site for their habitation was the craving for protection; and with the accumulation of property this demand for security increased. Thus places of great natural strength, which could be easily defended, were early turned to account. In a hilly region such situations were easily found, and in a lowland district an eminence on which a fortification could be erected usually became the centre round which the population gathered. Edinburgh, Stirling and Dumbarton are but the chief of many instances that might be quoted of towns that first took their rise under the shadow of a great rock. The strongholds erected on many of the volcanic bosses that are so conspicuous a feature of the Lowlands testify to the importance of such a situation in former times.

Another position which could be easily defended was often provided at a bend in a river or at the junction of a stream with its tributary. One of the most interesting examples in our own country is to be found at the meeting-place of the Tweed and the Teviot. Here at the end of the peninsula formed by the convergence of the two streams there formerly stood one of the most important towns in Scotland. The town

is now quite extinct, and its exact situation can only be surmised from the few remains that are supposed to mark the site of its castle. But Roxburgh was one of the original royal burghs, and so great did its population become that it was found necessary to erect a new town some distance from the old. It owed most of its importance to its defensive situation. As early as Saxon times a strong fort stood at the junction of the two streams, and in the twelfth century, in addition to its castle, Roxburgh was also fortified by means of a fort and a ditch. But with the rise of other towns in the neighbourhood, particularly of Kelso on the other side of the Tweed, and when the danger of incursions either of organised armies or of freebooters from beyond the Cheviots diminished, Roxburgh gradually declined in importance until to-day it is "an ancient but a decayed place."

Another motive for men drawing more closely together was furnished when, with more advanced and settled conditions of life, the desire for exchange arose. The rise of trade led to the development of centres where this exchange could be carried on; they naturally grew up where they were most readily accessible, and where it was possible to gather together the economic produce and powers of a wide area. One of the most favourable situations for this purpose was where a river could be forded, or, in later times, spanned by a bridge, thus forming the converging point of the streams of traffic flowing from different directions. The Roman road from Camelon crossed the Forth at the "passagium de tirpes," or "Forde of Tirps," to which Hardyng refers as the most convenient crossing-place for an army in the event of the bridge at "Camskinelle" being broken down; and the existence of this ford encouraged the development of the little community that had sought the protection of the fortified rock on which Stirling Castle now stands. Glasgow took its rise at the lowest point where a bridge could be thrown across the Clyde, and thus became the focus of the trade of the surrounding country. With the advance of navigation and the growth of a coastal and then of international trade, a position on the banks of a navigable river became of the greatest economic importance. Chiefly as a guarantee of protection from the sea-rover, the early traders were inclined to settle as far up the river as the conditions of navigation would allow, but such a position had the additional advantage of being in close touch with the hinderland, a matter of no little importance in times when difficulties of inland transport did much to hamper trade. Although Perth no longer ranks as a seaport its geographical position made it a centre of great importance in former times. Standing where a bridge connected both banks of the Tay, up to which such vessels as were able

> Fortie tunne of wyne to carry up and doune,
> For vitallying and keeping of the toune,"

could ascend in Hardyng's time, Saynt John's Town became the centre of the traffic that flowed through Strathmore.

Centres of exchange and of manufacture have frequently taken their rise at the entrance of a valley or where several valleys converge on the plain. The orographical map of Scotland furnishes many examples of

towns which owe their development, if not their origin, to such a situation. Inverness is one of the most striking instances. Here at the northern end of the Caledonian Canal several roads meet, partly owing to the fact that Loch Ness prevents direct communication for several miles between the east and the west side of the country. One route lies along Glencarron from the islands lying to the west; another comes from the east through the fertile tract that borders the Moray Firth; a third route crosses the Grampians and connects Inverness with the rich valley of the Tay; a fourth road from the most northerly part of the kingdom forms a connecting link between the capital of the Highlands and the Orkneys.

In the Southern Uplands there are many towns that have grown up at the meeting-place of several valleys. Langholm is situated where the valley of the Ewes Water (along which the main road to Hawick runs), the valley of the Wauchope Water, and the valley of the Esk converge, while Thornhill stands at the meeting-place of the roads from Crawford and Elvanfoot, from Sanquhar, and from the west through Moniave and Penpont.

When we come to discuss the geological formation of the country more will be said about its influence in determining the sites of centres of population, but meanwhile it is interesting to note that the vegetation, which is controlled to a large extent by the geology, plays a very important part in determining the distribution of the people. Very many of our towns seem to have taken their rise where two different types of vegetation meet: in several cases a town has arisen where the agricultural zone ceases and the pastoral begins, thus enabling the farmer and the shepherd to exchange the produce of their labours with the greatest ease. Other towns are placed in a similar relation to the agricultural and the fishing industries of the country.

We have seen that in early times two considerations were of importance in determining the distribution of centres of population, namely, the need for food and the desire for security. With the rise of commercial and industrial towns a new factor becomes of the first importance. To-day the question of defence is no longer an individual or a corporate question as in earlier times, and probably never enters into the consideration of the modern manufacturer who proposes to erect a factory. Moreover, in these days of rapid transport, when it is almost as easy to bring the produce of Canadian wheat-fields to the ports of this country as it was centuries ago to bring the produce of the surrounding country to the nearest town, the question of the food-supply has also come to be a minor consideration in determining the site where a town will arise: even the water-supply, so essential to all human habitations, can now be furnished by reservoirs many miles distant from the place where it is consumed. But, on the other hand, the leading factor in establishing communities under the industrial conditions of to-day never had to be considered at that stage of development when agriculture occupied the sole place as the basis of the social life of the community. It is only with the rise of industrialism that the question of the available amount of power has come to play so important a part in controlling the distribution of population. In the early stages of the industrial era proximity

to a river met all the needs of the case, and small manufacturing centres were widely distributed throughout the country. But the discovery of vast stores of mineral wealth and "the application of coal to the production of steam-power, which has been the greatest town-forming influence" in this country, led to the concentration of industrial life in those places where power was most easily obtainable. This process of localising industry in certain parts of the country has gone on until in 1901 nearly seventy per cent. of the population of Scotland inhabited the cities and towns. This fact, along with the improvement in the standard of life, which has marked the industrial era, has given rise to a very different type of town from the great smoky manufacturing centres with which every industrial nation is familiar. Several places throughout the country have attained considerable importance as health resorts, and at certain periods of the year contain large numbers of inhabitants. Although many pleasure resorts may seem to derive their importance from purely artificial causes, their prosperity always has a geographical basis, even if it be only the existence of some waste land that can be utilised as a golf course. Very often the causes that prevented the rise of a manufacturing population in any particular area—for example, the difficulty of access—favour the growth of the place as a health resort. The rock-bound coast, the pleasant pastoral scene, and the majesty of the mountains, which attract the dwellers in the city, are in the last analysis the product of the geological history of the country.

But for the rise of many towns it is not always possible to find a geographical explanation. This is frequently the case with the towns that have been selected as the seat of the administrative authority. They may possess no peculiar natural advantages, and yet by virtue of their selection as the centre of justice and administration they become the home of various public institutions, such as schools, museums, public galleries, and also of banks and insurance offices, all of which tend to increase their importance and further their development.

A comparison of the maps of Scotland showing the geological structure, the orographical features, the climate, the vegetation, and the distribution and density of population proves conclusively how absolute is the geographical control upon the life of the people. The map prepared by M. Marcel Hardy to illustrate the geographical distribution of plant associations in the northern half of the kingdom also establishes the vital connection existing between the vegetation of the country and its population, for the populated areas exactly coincide with the cultivated land. The population is chiefly confined to the land below an altitude of six hundred feet, but it is very unevenly distributed. In the area north of the Firth of Clyde and west of the fifth line of longitude, the only indications of human settlement are to be found along the shores of the inlets, with which the west coast is so much indented, or following the courses of the streams into the glens. From the Mull of Kintyre to Cape Wrath, Rothesay and Campbeltown are the only places throughout this great area with a population of 10,000 inhabitants; Oban, the next in size, has about half that number, while Fort-William contains a little over 2000 people. The county of

Argyll supports 24 persons per square mile, Inverness-shire has a density of 21, while Sutherland has only 11 persons to the square mile. Economic causes may have some share in explaining the paucity of population in this region, but the chief cause can only be found in the geographical conditions. In some parts of the region the average annual rainfall is over eighty, and at one or two stations in Inverness it exceeds a hundred inches per annum. The greater part of the district is composed of Lewisian gneiss, Dalradian schists, and Torridon sandstone, resulting in a very mountainous region with a thin and hungry soil. In the words of M. Hardy, "La configuration du terrain et les conditions climatiques empêchent le développment des forêts et des pâturages. La bruyère et quelques maigres herbages constituent la végétation actuelle. La population y est réduite à un minimum."

A very marked contrast is found along the shores of the Moray Firth. The density of Nairn at the last census was 57 persons per square mile, Elgin had 94, Banff had 98, while the adjacent county of Aberdeen supported 154 inhabitants per square mile. In this area there are many centres with a considerable population, including Nairn, Elgin, Forres, Huntly and Keith in the interior, while along the seaboard Burghead, Lossiemouth, Cullen, Banff, Peterhead and Fraserburgh are situated. When we come to examine the physical features of this region we find that it is a lowland country composed chiefly of Old Red Sandstone, which has produced a very rich soil. Moreover, the average annual rainfall is less than forty inches throughout the whole area, and in most places approaches more nearly to thirty inches.

On examining the statistics of population for some of the southern counties of Scotland we find that Berwick, Dumfries and Wigtown have a density of 67 per square mile: Peebles and Kirkcudbright support a little over 43 persons on the same area; Selkirk is the most densely populated of the counties in the Southern Uplands, with 87 persons per square mile. At very few stations in this part of Scotland does the average rainfall exceed fifty inches. The country is an upland region, intersected by fertile valleys, and chiefly composed of rocks of Silurian age, with intrusions of eruptive rocks and patches of strata of much younger date. While the valleys are cultivated and support a large population, the hills are given over to the rearing of sheep, for which they are admirably suited, but this industry does not cause an accumulation of population in any one centre.

It is when we come to the Midland counties of Scotland that we find the densest population and the largest towns. Stirling has a density of 316 persons per square mile, Fife 434, Lanark 1524, Renfrew 1120, and Edinburgh 1335. The rainfall seldom exceeds fifty inches in the year, while the average at most of the stations is much below that figure. But the geological structure of this region is very different both from that of the Highlands to the north and the Uplands to the south. The rocks here belong chiefly to the Carboniferous system and their economic value has been the most important factor in the development of the Midland Valley and has given rise to many great centres of population.

So far, however, we have mentioned only the solid geology of the country. In conjunction with the atmospheric processes it has determined the topographic features, which, in their turn, have exercised an important influence upon the distribution of the towns and villages. But no less necessary to our inquiry is a consideration of the surface or drift geology. As a result of glacial action very large tracts in Scotland are covered with deposits of till or boulder clay, which furnish a very rich and deep soil. These deposits are confined to the lower grounds, and with them traces of population disappear almost entirely from the hills. In addition to this clay or till, great deposits of alluvium have played a large part in the agricultural development of the country. They are chiefly found along the river valleys and occupying the sites of the ancient lakes which, as Pont's maps indicate, were a conspicuous feature of the country even in comparatively recent times. It is a noteworthy fact that some of the most important centres of population in Scotland are situated on or near the line where the alluvial deposits meet the boulder clay. Unfortunately the Ordnance Survey maps showing the drift geology have not been published, but if this were done and a differentiation of the various deposits into boulder clay, sand, and gravel were made, the explanation of this phenomenon might be forthcoming, and would probably be found to have some connection with the question of the water-supply.

South of the Forth and Clyde strips of alluvial deposits are found along the river valleys. In the Tweed valley, Hawick, Ancrum, and Kelso stand at the junction of the alluvium and the drift; while Galashiels and Melrose are similarly placed in the valley of the Gala. Dumfries stands on the edge of the alluvial strip that runs along the Nith valley, while Dalbeattie and Kirkcudbright occupy like positions in the valleys of Urr Water and the Dee respectively. Wigtown and Newtown Stewart border the alluvial tract in the Cree valley. On the edge of an alluvial belt that runs along the coast from Ayr to Ardrossan are situated Stevenston, Kilwinning, Monkton and Ayr. Hamilton, Motherwell, Ballantrae, Girvan and Campbeltown have also taken their rise upon deposits of alluvium.

In the northern part of the country many of the river valleys have been overspread with an alluvial layer, and along its margin the population is chiefly concentrated. Such strips are to be found in the valleys of the Don, the Ythan, the Spey, and the Nairn. An alluvial belt also stretches along the shore of the Moray Firth and makes a very important contribution to the fertility of this region, and partly accounts for the density of population that marks the area. At the junction of the alluvium and the drift Elgin, Forres, Dyke, Nairn, and Inverness are situated. On the margin of the strip that skirts Cromarty Firth stand Dingwall, Evanton, and Alness, while Tain occupies a similar position on Dornoch Firth. Along the valleys of the little streams that enter the sea on the north and north-west of the country, and on the floor of the narrow glens which intersect the Highlands, the alluvial deposits furnish the only available arable land and enable a scanty population to eke out a scantier existence.

It is, however, in the Midland Valley that the alluvial deposits are most widely spread, and the position of the centres of population with regard to them is very striking. Many of these tracts are the result of upheaval and take the form of raised beaches, varying in height from twenty to as many as a hundred feet. They are of the utmost importance from the agricultural point of view, for where the Carboniferous strata, characteristic of this region, are devoid of any alluvial covering, nothing but a poor, hungry soil is found. These beaches are best developed in the estuaries of the Forth, the Tay, and the Clyde, and, as Sir Archibald Geikie has pointed out, "the addition of these strips of level ground to the margin of the land has had an important influence on the human population of these districts, for it has provided many hundreds of square miles of arable ground, comprising admirable sites for dozens of villages and towns as well as for excellent coast roads."

A small strip of alluvium is found at Belhaven on the Haddingtonshire coast and extends westward to Preston. A wide and very important tract covers the valley of the Forth. Its southern boundary runs from Bo'ness westwards, through Grahamston and Falkirk, to Stirling; a tributary strip extends up the Carron valley, in the middle of which Larbert stands, while at its head Denny and Dunipace are situated. From Stirling the southern margin of the alluvial strip is continued to near Gartmore and then turns northwards to Aberfoyle. The northern margin extends from the Lake of Menteith practically due east, and after including the tributary strips that follow the valleys of the Doune and the Devon, terminates on the coast near Kincardine. Situated on or near the junction of the alluvium and the drift we find Callander, Doune, Bridge of Allan, Alva, Tillicoultry, Dollar, and Alloa.

Another important alluvial belt extends with varying breadth from Uddingston to the mouth of the Clyde, and on its southern edge several very important centres of population have arisen, including Uddingston, Cambuslang, Rutherglen, Cathcart, Pollokshaws, Paisley, Johnstone, Port-Glasgow, and Greenock. The northern margin of the strip skirts the eastern shore of the Gareloch, stretches up the valley of the Leven to the shores of Loch Lomond, and then proceeds along the Clyde valley through Glasgow to Uddingston. On the northern borders of this tract stand Helensburgh, Cardross, Dumbarton, Renton, Alexandria, Jamestown, Bonhill, Old Kilpatrick, Dalmuir, Glasgow, and Shettleston. On the margin of the strip that lies along the Kelvin valley and over which the Forth and Clyde Canal is carried for part of its course, Kilsyth and Kirkintilloch are situated.

Along the northern margin of the alluvium in the estuary of the Tay, Carnoustie, Monifieth, Broughty Ferry, part of Dundee, and Perth have taken their rise. An alluvial strip stretches from Perth to Crieff, along which the Caledonian Railway runs for some distance; another layer covers the floor of the Earn valley and on its margin stand Invermay, Forgandenny, and Abernethy. On the edge of the strip along the southern shore of the Tay Leuchars and St. Andrews have been built.

Extending from Montrose along the South Esk there runs a small patch of alluvium on the border of which stand Brechin and Tannadice, while Marykirk is situated on the margin of the strip along the valley of the North Esk. A small patch round Stonehaven completes the most important examples of these alluvial deposits.

It may be remarked at this point that a very large number of towns and villages have arisen within a short distance of the line of fault dividing the Highlands from the Midland Valley. Besides Callander and Crieff, which have already been referred to, Comrie, Dunkeld, Blairgowrie, Alyth, Kirriemuir, Gilmerton, Aberfoyle, Fowlis, Monzie, Bankfoot, Stanley, Caputh, Lintrathen, Menmuir, Edzell, Fettercairn, and Fetteresso are all situated along this line, and owe much of their importance to their position at the entrance of the valleys leading from the Highlands to the more fertile plains.

Although, as we have seen, the alluvial tracts which are so widely distributed throughout the country, and the raised beaches that are a feature of the estuaries, have added to the fertility and prosperity of the land, yet the influence of the geological and climatic forces at work has not always been so beneficial. The evidence presented to the Commission on Coast Erosion frequently illustrates how the prosperity of many towns is threatened, and in some cases has been entirely destroyed, by the action of earth and atmospheric processes. By the growth of sandbanks at its mouth a harbour may become blocked, while a river port may have its traffic seriously interfered with, if either through a dry season or by the disposition of mud in its bed the river ceases to be navigable through a considerable part of its course. Again, large tracts of land may be devastated and rendered barren by the work of moving sand. Pennant mentions that at the time of his first tour in 1771 two farms were all that remained of the parish of Forvie, which at the beginning of the seventeenth century was all arable land but had then the appearance of an Arabian desert. On the Ayrshire coast the same forces of destruction have been at work over great stretches, and at various times the towns and villages on that seaboard have suffered considerably. In some cases the roadway has been buried beneath vast masses of wind-blown sand, leaving no trace of its former existence but the tops of the hedgerows.

With these general considerations and this brief survey of the topography of the country as it has affected the distribution of centres of population, we must now turn to a consideration of how the geographical position of different towns has contributed to or hindered their development at various times in the history of the country.

(*To be continued.*)

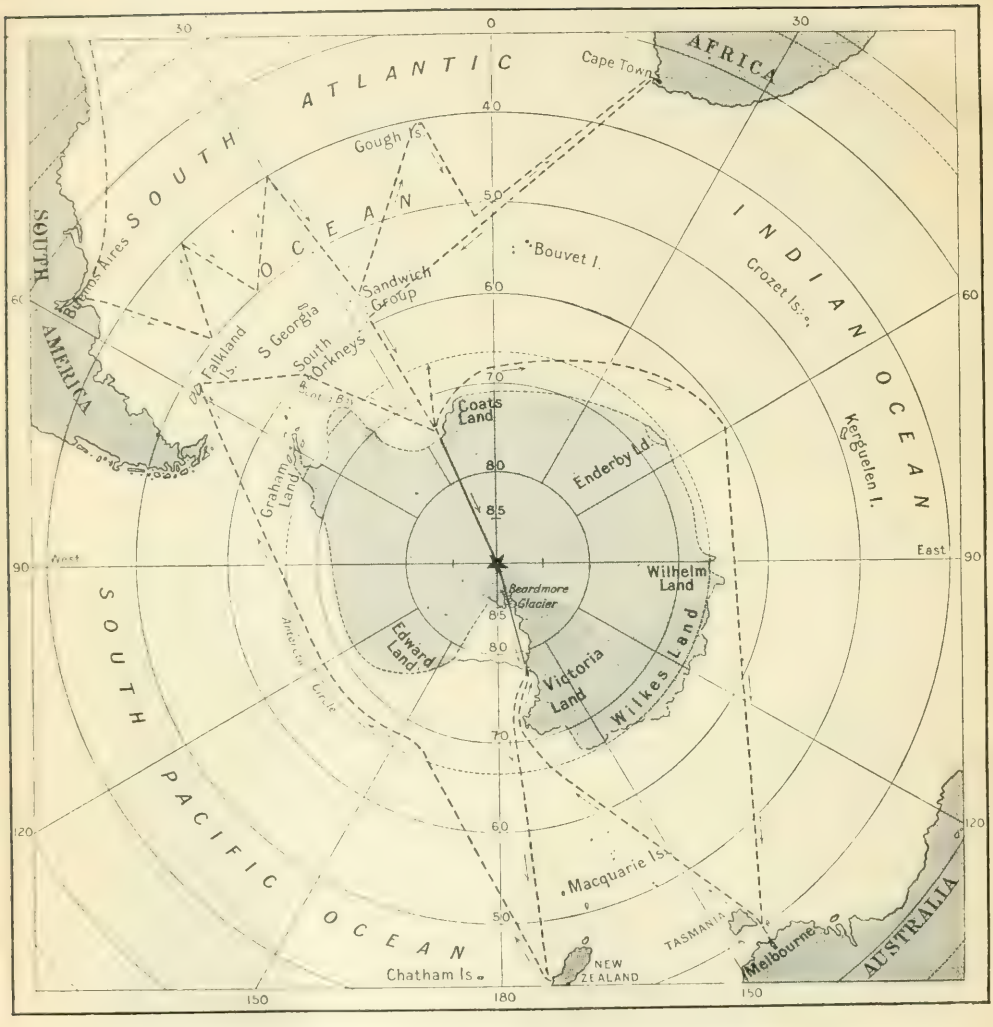
THE NEW SCOTTISH NATIONAL ANTARCTIC EXPEDITION, 1911. (*With Sketch-Map.*)

A MEETING of the Society was held in Edinburgh on March 17, when Dr. W. S. Bruce gave an address on "The Plans of the New Scottish Antarctic Expedition for 1911."

Professor Geikie, who presided, said, at the outset, that his old friend and colleague, Professor Penck, the distinguished president of the Geographical Society of Berlin, had recently protested against the Exploration of Antarctica being reserved for any particular nation. He cordially agreed with him—any such claim was simply ridiculous. There was no copyright in Antarctic any more than there had been in Arctic Exploration, or indeed in geographical exploration anywhere. As a Geographical Society they welcomed any expedition that had for its object to increase our knowledge of the world we live in. They hoped and believed that the British Expedition under the gallant Captain Scott would return crowned with success. They were confident that our American cousins might be trusted to make the best of their opportunities, and the same thing might be cordially said of our foreign friends. Should Dr. Bruce be enabled to set sail for the Far South, as they hoped he might, all those who knew him felt sure that the results of his expedition would not be less important than those of the others.

Dr. Bruce spoke first on the History of South Polar Exploration, and said that in this connection the name of Captain Cook, who was the first to wipe out a large portion of the unknown Antarctic Regions, could not be omitted. Before the time of Cook only a small portion of Australia and Tasmania had been known, but Cook succeeded in proving, during his voyages, that if there was an Antarctic Continent, it must lie entirely within the Antarctic Circle.

Dr. Bruce, however, dwelt specially on the work done by Scotsmen, the first of whom was Captain James Weddell, who sailed from Leith in the brig *Jane* in 1823. Weddell succeeded in attaining a higher latitude than his predecessor Cook to the south of the South Atlantic, and no one since his day in that longitude had attained a higher latitude. He was particularly fortunate in having here an open sea practically free of pack ice which had not been experienced by subsequent explorers, among whom were Bellinghausen, Biscoe, Moore, and Ross, as well as the *Scotia*. Another prominent Scotsman associated with Antarctic Exploration was Sir James Clark Ross of the *Erebus* and *Terror*, who during the years 1839-1843 did an amount of solid work that had been unequalled by any subsequent expedition. Ross, in spite of certain erroneous results, due to imperfect apparatus, was the first to undertake deep-sea sounding in the Antarctic Regions. Along with Sir James Clark Ross was another, who, though an Englishman, was at least a Scottish graduate, namely, Sir Joseph Hooker, a graduate of the Glasgow University. Sir Joseph Hooker's work was of a world-wide reputation, and it was interesting to note that this veteran of ninety-three years of age was to-day the only survivor of Sir James Clark Ross's Expedition in 1839. Hooker still



Map showing proposed route of the Scottish National Antarctic Expedition, 1911.

took a living interest in all the recent Polar Expeditions which had taken place during the last eighteen years. The *Challenger* was also closely associated with Scotland, witness the names of Sir Wyville Thomson, Sir John Murray, and Mr. J. Y. Buchanan. The *Challenger* also led us to expect a profusion of animal life in the deep Antarctic waters.

Dr. Bruce then went on to detail the final plans of the new Scottish National Antarctic Expedition as follows :—

It is hoped that the Expedition will leave Scotland about May 1st, 1911, and reach Buenos Aires on about June 20th. From Buenos Aires a departure will be made on about July 1st, and a zig-zag course steered between 40° S. and 50° S. for the purpose of broadly completing the bathymetrical survey of the South Atlantic Ocean begun by the *Scotia* in 1902-04. Cape Town should be reached on September 1st.

At Cape Town the ship will coal and refit, and a course will be steered for the Sandwich Group, where it is hoped funds will allow another vessel to meet her, carrying equipment, coal, and fresh food from Buenos Aires. Further soundings will be made between Cape Town and Sandwich Group, to try and prove the connection of the hypothetical "Rise" joining the Sandwich Group and Bouvet Island, as well as the "Scotia Rise," discovered by the Scottish Expedition, 1904.

From the Sandwich Group the expedition will steer for Coats Land or some place with suitable anchorage and landing in the vicinity of Coats Land. A party of 10 or 12 persons will be landed here and a house erected. As there appeared to be no suitable landing-place along the 150 miles of Coats Land discovered by the Scottish Expedition in 1904, the expedition may have to go a little further west or east, possibly as far east as Cape Ann, Enderby Land.

The ship will thereafter proceed to Melbourne by a route in as high a latitude as possible, taking soundings and carrying on deep sea research, having as a special objective the determination of former continental connections. The ship will winter at Melbourne, carrying out such work as funds will allow and time will permit by means of one or more short cruises to the south. Co-operation with Australian and New Zealand Governments and Scientific Societies in any special work which they would wish to have accomplished in these seas would be welcomed.

In the spring the ship will push southward to M'Murdo Strait, Victoria Land, in order to send a sledge party southward with supplies for another party, which under my leadership will be crossing over the Antarctic Continent by way of the South Pole from Coats Land. The meeting of the trans-continental party and the relief party will likely be in the vicinity of the Beardmore Glacier. The combined parties will then return to the ship and sail for New Zealand. The Scottish Expedition will not make any special investigations in the region of M'Murdo Strait, because since the publication of these plans in April 1908 and April 1909 Captain Scott has chosen this region as his special sphere of work.

From New Zealand the ship will proceed across the Pacific Ocean to Magellan Straits or the Falklands, carry on such oceanographical research as is possible in as high a Southern latitude as the winter season will permit. In the Spring the expedition will proceed southward in the Weddell Sea to relieve the wintering party which will now have spent two years there. This party will devote special attention to the survey of the coastline of Antarctica both to the east and west of the station. Complete meteorological, magnetic, and other physical and biological outfit will be provided, and it is hoped that arrangements will be made to co-operate with Meteorological Stations at Scotia Bay, South Georgia, Cape Pembroke, and elsewhere. The total cost of the Expedition will be about £50,000.

At the close of the lecture the following gentlemen addressed the meeting in support of the proposed expedition :—

Dr. John Horne, F.R.S., representing the Royal Society of Edinburgh, stated that upwards of twenty papers giving the results of the *Scotia* expedition had already appeared in the Transactions and Proceedings of the Royal Society, and it was universally admitted that these reports would take high rank as important contributions to our knowledge of the Antarctic regions. These papers formed only a small instalment of the scientific results of the *Scotia* expedition. The rest of the materials were now in the hands of specialists. A strong desire existed that Dr. Bruce should have another opportunity of adding to our knowledge with reference to the main geographical features of the Antarctic continent. He was commissioned by the Council of the Royal Society to give the most cordial recommendation to the Scottish public for financial assistance.

Professor J. Graham Kerr, F.R.S., representing the Royal Philosophical Society of Glasgow, said his society desired to be represented there, and that he should express to them the very cordial sympathy and interest which they felt towards Dr. Bruce and the work he had done. They could not have any doubt as to the success of Dr. Bruce's expedition. Personally he felt every confidence that the Government would do a great deal towards it, because they all knew the present Government contained a number of men who were known to be deeply interested in scientific work. They would see to it, surely, that Dr. Bruce got all the financial assistance that he required, and if they failed it remained for the people of Scotland to see that he was provided with the means otherwise.

The Right Hon. The Earl of Cassilis, representing the St. Andrew Society, commented on the number of Polar expeditions that Dr. Bruce had taken part in, and observed that he had plenty of nerve and grit, and they were certain he would be successful in the expedition he was going to lead.

Professor Cossar Ewart, F.R.S., Edinburgh University, expressed the indebtedness which zoologists felt to Dr. Bruce for the enormous amount of information collected from within the Antarctic Circle. He had been the means of adding dozens of new species to science.

Professor D'Arcy W. Thompson, C.B., Scottish Fishery Board and University College, Dundee, said there was a treasure of scientific discovery still hidden in the Antarctic seas which they and he would never visit, and many dangers which they and he would never be called on to face, and they believed that Dr. Bruce, by his training, his experience, his enthusiasm, was the man fitted, no man better, to go there to be a leader of men among all those dangers and difficulties.

Mr. George G. Chisholm, M.A., B.Sc., Lecturer on Geography in the Edinburgh University, also spoke in support of the expedition.

Mr. R. N. Rudmose Brown, D.Sc., Lecturer on Geography, University of Sheffield, as one who had accompanied Dr. Bruce in previous expeditions, bore testimony to his qualities as a leader of men and a doer of scientific work. You could never get to know a

man really well under civilised conditions of life, but when you had roughed it in a sledge with him, frozen and starved with him, you began to get to know him. He knew Dr. Bruce in that way. It was a great test of a man, and Dr. Bruce had stood that test. All those who had sailed with him north or south would gladly do so again, and some of them hoped to be able to do so. No one was more ready to incur risks and face difficulties in the cause of science, but Dr. Bruce had always refused to degrade exploration to the form of a mere hazardous sport. In the *Scotia* his extraordinary energy and determination and enthusiasm pervaded the whole ship. If the Scottish nation sent Dr. Bruce southwards on his long journey of exploration, he was sure no expedition would achieve more or bring more honour to the country which sent it forth.

AMPHIBIOUS STEAM NAVIGATION FOR AFRICAN RIVERS: A SUGGESTION.

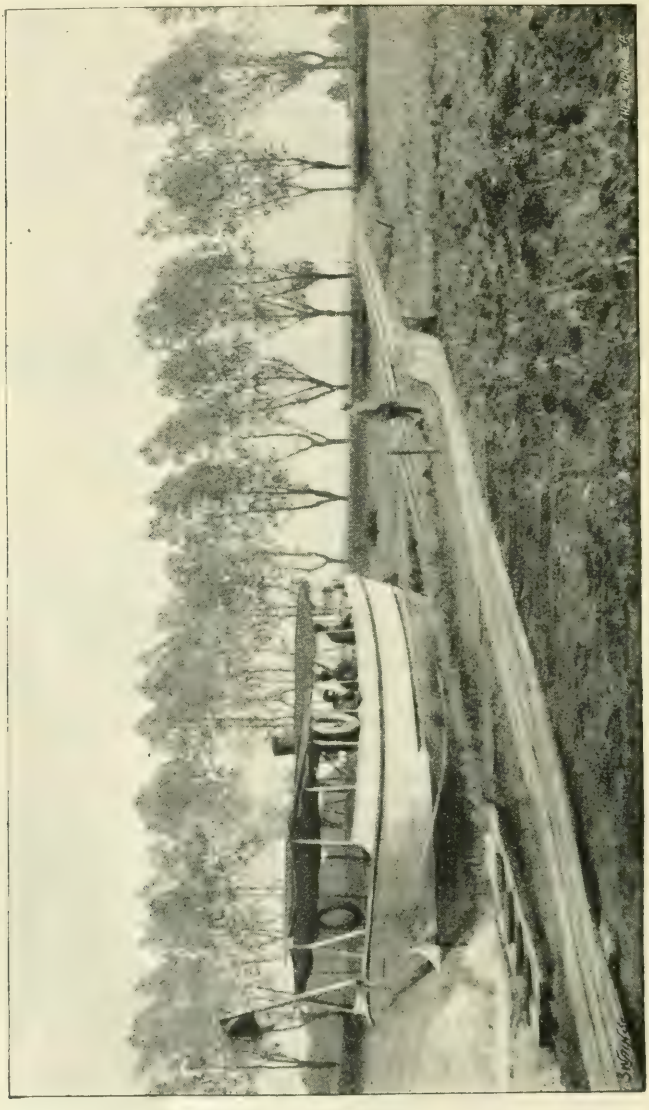
By H. J. Peddie.

(*With Illustration.*)

The "Dark Continent" is now being rapidly opened up to civilisation and commerce. As the pages of this *Magazine* show, roads and railways are being pushed into the interior in all directions, and the rivers are also being utilised largely as highways through it, and are evidently destined to play a very important part in the development and material prosperity of the Continent. There are, however, serious impediments to the full utilisation of the rivers, such as shallows, rapids, waterfalls and cataracts. No doubt in the course of years these will be avoided by means of connecting canals with locks, and large steamers will then be able to penetrate easily from the coast to the heart of the Continent. At present, however, these obstacles seriously impede river navigation, and greatly increase the cost of transport to and from the interior. In many cases the goods have to be transhipped and carried by native porters, or in the rare cases where these exist, by light connecting railways, past the obstructed section of the river, and then reshipped again. Any method, therefore, by which this difficulty can be avoided at moderate cost, and with comparative ease and facility, cannot fail to be of the greatest value in opening up and developing the natural resources and trade of the country.

The "Amphibious steamboat" seems to provide just what is required. The inventor is a Swede, Mr. L. C. J. Magrell, and the boat has plied successfully on and between two large lakes, the Fure Sö and the Farum Sö, situated some twelve miles from Copenhagen, and separated from one another by a strip of land about 1100 feet wide. During three months in 1895 the boat conveyed 20,000 passengers.

The accompanying illustration, kindly furnished by the editor of the *Engineer*, shows the boat, which is called the *Svanen*, leaving one lake and traversing the land between it and the next. As will



The *Svanen* leaving the water.

be seen from the illustration, the *Svanen* is a small screw-steamer, furnished with two pairs of flanged wheels at the sides. The axle of the foremost pair is geared to the steam engine which drives the propeller shaft. When the boat approaches the land, it is steered into

what may be described as a sort of funnel-shaped lock, which tapers down to a width only two inches greater than that of the widest part of the boat, giving a play of one inch on each side of two parallel fillets, which extend along the outside of the boat. When the narrowest part of the lock is reached, the boat passes into a short dock, of the same width, with parallel sides, and is allowed to advance slowly until the front wheels engage with rails, which for this purpose extend below the water-level. The wheels are then thrown into gear and the boat begins the ascent. In due course the hind wheels find their way to the rails, and the boat is carried on its upward course, up a slope sometimes as great as 1 in 30, at the rate of 250 feet per minute.

On reaching the summit the boat traverses a continuation of the rails, until it reaches the spot where it again takes the water. Here it descends by other locks, similar to those which have been just described. The boat thus traverses both water and land with equal facility.

Such a boat seems admirably adapted for African rivers, and would appear to be a simple means of obviating the present difficulties of transport. The locks, which can be constructed of timber, and the connecting railways, could be easily made by native labour, under European supervision, and with suitably designed and constructed boats a large river traffic could be developed, and the country opened up.

Modifications of the system will also readily suggest themselves. Thus, for example, such a boat could easily travel from a river over a line of railway made for the purpose, to a town, village, or plantation entirely away from the course of the river, and discharge and load cargo at a loading bank at the destination, which would thus be directly connected with the river. Or, again, the boat might be constructed to act only as a tug and a land locomotive, being used to tow several barges fitted with side wheels along rivers. When the river had to be left, owing to some natural obstruction, the boat would be disconnected from the barges and would ascend to the summit of the lock and, making itself fast there, would, by means of a special steam-capstan and hawser on it, pull the various barges one by one up to a "lye" and then convey them as a train over the railway, either to join the river again, or to a land destination.

The amphibious steamboat may further play a useful and important part in connection with the lakes on the Cape to Cairo railway. Amphibious steamers, of the ordinary type for ferrying over railway waggons, could be utilised for ferrying the railway waggons across the lakes, so as to avoid all transhipment of goods from the waggons. In this case, the amphibious steamer would be run into the parallel dock which would be closed at the end, and would be of such a depth that the rails on the deck of the vessel were level with the metals of the railway, which would meet the vessel in the dock. The waggons could then be easily and quickly shunted on to the steamer and ferried across to the other side, and then shunted off in a similar manner on to the railway. It is obvious that this method of ferrying waggons could with advantage be adopted between Dover and Calais, whenever railway waggons with adjustable wheel gauge are adopted, and such waggons

could then pass from the railway lines of this country over the European and Asiatic lines, between the extreme west and east.

The system is equally applicable to rivers other than those of Africa, and under the ægis of the recently sanctioned Development Commission it might be effectively utilised in inaugurating and developing a national system of steam navigation on British canals and other waterways in order to do away with waterlocks with all their disadvantages.

TYPES OF VEGETATION IN SCOTTISH LAKES.

(With Illustrations.)

WE noted here briefly a few years ago (xxii. p. 213) a paper by Mr. George West on the plants of certain Scottish lakes, which was accompanied by some beautiful photographs. Mr. West has continued his investigation of this subject, and has recently published another paper (*Proc. Royal Soc., Edin.*, xxx. 2, 1910), illustrated by a series of sixty-two plates. By kind permission of Mr. West and the Royal Society, we are

FIG. 1.—Western shore of Loch Ken.

permitted to reproduce here some of these illustrations, which form representative views of certain types of Scottish scenery.

In this paper Mr. West discusses the lakes of (1) North-west Kirkcudbrightshire, (2) South-east Kirkcudbrightshire, (3) Wigtownshire, (4) Fife and Kinross. In addition to his study of the lakes, his investiga-

tions included a study of the vegetation of the sands of Luce, and of the Isle of May. In selecting a few of his numerous illustrations for reproduction we have included views of both these, as they show certain general points of much interest to the geographer, for whom the minute differences between different lochs, as regards vegetation, is of less importance.

The first two views illustrate the conditions in Loch Ken, a lake of the area included in *North-west Kirkcudbrightshire*. Loch Ken proper lies between the grounds of Kenmure Castle and the Boat-of-Rhone railway viaduct: but below the viaduct, after the junction of the river Dee, there is a narrow lake-like region, which extends below Crossmichael, and may

Fig. 2.—Eastern shore of Loch Ken.

be regarded as a prolongation of the lake. The lake is interesting as presenting a combination of highland and lowland characters, though it only lies 142 feet above sea-level. The water is only slightly peaty at the head of the loch, which receives drainage from villages and cultivated areas, and is thus rich in food salts. After the entrance of the Dee the water becomes more peaty, but in spite of this the vegetation below this point is more of the lowland type than it is further up.

Fig. 1 is a view taken from the west shore, two miles from the head of the loch, looking south-east. In the water the bulrush *Scirpus lacustris* is growing freely, as it does throughout the loch, both in the water and on the shore left exposed by the retreat of the water. On the shore the dominant species is bog myrtle, which reaches a height of five feet. The taller bushes are alder (*Alnus glutinosa*), while mingled

with the bushes are plants of hemlock dropwort (*Œnanthe crocata*) and marsh thistle (*Cnicus palustris*), as well as ferns and other plants.

Fig. 2 is a view taken on the eastern shore near the viaduct, and shows vegetation more of the lowland type. The shore is well-wooded, and the woods shelter the water so that water-ranunculus and yellow water-lily both occur.

Fig. 3 is a view of the Black Loch, Wigtownshire. This loch is situated within the grounds of Castle Kennedy, not far from Stranraer, and has brown and peaty water, reaching a maximum depth of fifty feet.

Fig. 3.—Black Loch, Castle Kennedy.

The shore at the point shown in the figure is lined by a dense growth of reed-mace bulrush (*Typha latifolia*), behind which is purple loosestrife (*Lythrum salicaria*).

Figs. 4 and 5 are two illustrations of the Sands of Luce in the same county. The sands extend about six miles along the coast, and stretch inland about a mile and a half, but the dunes are nowhere high. They begin immediately above high-tide mark, and are covered with the sand reed (*Ammophila arundinacea*). Fig. 4 shows the site of a dried pool on the sands. The bottom of the pool is composed of a close sward of water-purslane (*Peplis portula*), marsh penny-wort (*Hydrocotyle vulgaris*)

and sand-sedge (*Carex arenaria*). At the margin of the old pool are

FIG. 4.—Site of dried pool on Sands of Luce.

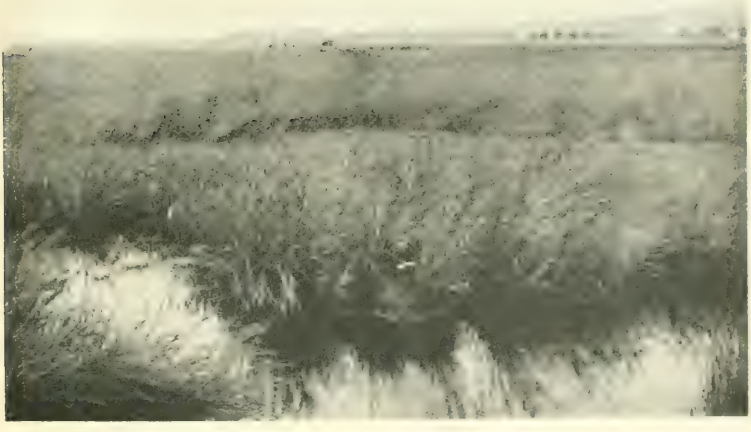


FIG. 5.—Marsh on Sands of Luce.

great tufts of rushes (*Juncus effusus*), while the sand-reed is seen creeping over the sand-dunes in the rear. The photo shows well the way

in which the vegetation fixes the drifting sand, and reclaims it from the sea.

Fig. 5 illustrates an earlier stage in the same process. It was taken at the east end of the sands, near Low Torrs, and shows the maritime rush (*Juncus maritimus*) in a brackish marsh. Elsewhere on the sands a kind of sward has been formed by the aid of sand-sedge, creeping willow and mosses.

Figs. 6 and 7 show two interesting views of the Isle of May, situated near the entrance of the Firth of Forth. The island is devoid of peat, and all peat-loving plants are absent. From its situation it is much swept by the wind and by salt spray, both conditions very unfavourable to

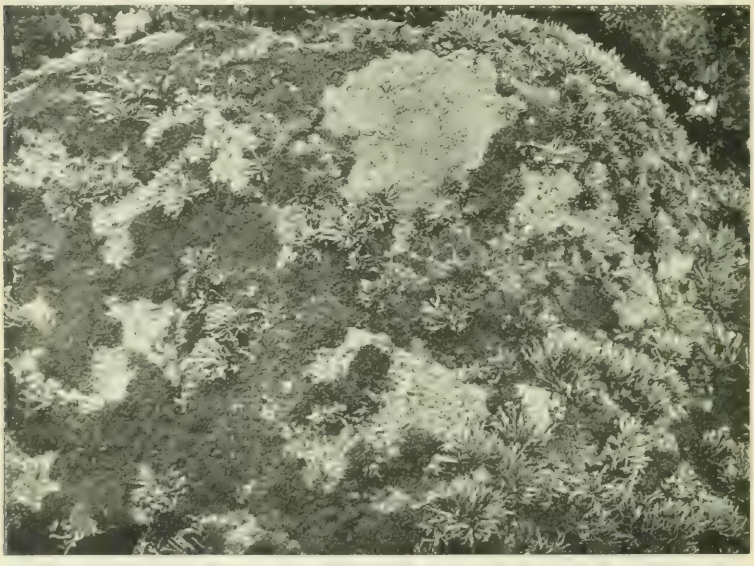


Fig. 6.—Lichens on shore rocks, Isle of May.

vegetation. On the eastern side especially, the (igneous) rocks slope upwards gently from the sea, and are, over a large area, quite devoid of soil. The only vegetation which they lodge is made up of gaily-coloured lichens. Fig. 6 shows a near view of a part of this rocky slope, the numerous lichens, both crustaceous and foliaceous, being well seen.

On following these sloping rocks landwards, it is found that as one ascends further from the area reached by drenching spray patches of vegetable mould are found in sheltered places, and the first hardy flowering plants appear. Among these tussocks of sea-pinks (*Armeria maritima*) and sedum (*S. angelicum*) are noticeable. Fig. 7 shows a tuft of sea-pink, and illustrates the way in which it maintains itself on this inhospitable ground. A part of the rock has been removed to show the long root which it sends downwards in search of suitable soil. The two pictures afford a very interesting example of the way in which land is

colonised by plants, even under conditions which seem highly unfavourable.

As already stated, Mr. West's paper is accompanied by a great num

Fig. 7.—Sea-pink on Isle of May, showing long root

ber of illustrations, in addition to those here reproduced. They will be found of great interest, especially to teachers, as illustrating the conditions which prevail in the parts of Scotland discussed.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

Honorary Diploma of the Society.

At a meeting of Council held on the 22nd February, the Honorary Diploma of Fellowship was conferred on M. Aurel Stein, Ph.D., in recognition of his geographical and archæological explorations in Central Asia.

Dr. W. S. Bruce's Antarctic Expedition.

It was agreed to have a meeting on the 17th March in support of Dr. W. S. Bruce's proposed Antarctic Expedition (cf. p. 192).

GEOGRAPHICAL NOTES.

Asia.

The Duke of the Abruzzi's Expedition to the Himalayas.—Very little information has hitherto been available in regard to this expedition (cf. vol. xxv. p. 370), but on February 16 the Duke delivered a lecture at Turin, from the reports of which we glean the following details. Our previous note described the composition of the party, which travelled to Bombay and thence to Srinagar. The caravan, which started from this point, travelled by the Indus valley, and reached Skardo (Baltistan), and then the Baltoro Glacier by the Shigar and Braldoh valleys. Within a month of leaving Srinagar the party arrived at the corner of the Baltoro and Godwin-Austen Glaciers, within sight of the huge pyramid of K^2. A base camp was established about the centre of the Baltoro Glacier, where there was a grassy spur upon which goats and sheep could thrive. From this camp, which was placed in charge of an Englishman, Mr. Baines, parties of coolies kept in touch with the expedition and carried food and other necessaries to the higher glaciers when needed. A high camp was then pitched at the foot of the southern wall of K^2, and from here exploring parties struck out to examine the mountain and glaciers on the west and east sides. But from no point could any route be traced which would reach to a reasonably high altitude on the peak. The mountain has only very steep ridges of broken rock, while its walls are sheer precipices partly covered with overhanging glaciers. The Duke, however, made one attempt to climb the mountain by the east-south-east ridge. After reaching an altitude of about 16,000 feet the attempt had to be abandoned, not only on account of the dangerous character of the ascent, but also from the utter impossibility of carrying even the lightest of necessary camp equipment. A second attempt on the west side enabled the Duke to reach, not without great difficulty, a fairly high *col* on the watershed. Relinquishing all hope of K^2, the party spent several days in surveying the upper basin of the Godwin-Austen Glacier, and the Duke climbed part of the south-east ridge of the Staircase Peak, obtaining a good view of the unknown district to the east, as well as of the north precipitous slope of K^2. This occupied the whole of June, during which month a strong wind prevailed, especially on the higher points, which made ascents of above 19,000 feet very trying on account of the cold.

While still at the foot of K^2 the party had been able to study the beautiful snowy dome of Bride Peak (25,119 feet), which stood about twenty miles due south. As this was the only high mountain in sight which did not look quite impossible, the Duke determined to try an ascent, although the most favourable month, June, was already over.

Accordingly the whole expedition returned to the Upper Baltoro Glacier and proceeded along its south-east branch to the foot of the great glacier which descends from the east sides of Bride Peak. A camp was made here from which a lighter camp equipment was with great difficulty carried up some height on the broken glacier to the Chogolisa saddle. From this point an *arête*, nearly all ice and running south-east, leads to the top of Bride Peak. Unfortunately the weather changed entirely, as might have been expected, and the monsoon season set in. Heavy snowfalls and almost continuous dense fogs were very serious obstacles to climbing. Though the Duke stayed for three weeks at an altitude of over 21,000 feet, provided with only the barest necessities of life, he was only able to make two definite attempts to scale the mountain. On the first he reached a ridge of 24,000 feet. On the second, July 18, the Duke and two guides succeeded in reaching a height of 24,583 feet. Unfortunately, at this point, and at so short a distance from the actual summit, a dense fog prevented further progress. The climbing had been of a very dangerous and arduous character, and hours of struggle through soft snow added to the exhaustion of the climbers. Nevertheless the Duke and his two companions suffered so little from the actual high altitude that they were able to stop three hours at this point, hoping in vain that the fog might lift. At last, at a late hour, they were compelled to descend. As there was no probability of improvement in the weather the Duke broke up his camp and came away.

The altitude reached on the second attempt on Bride Peak has never been surpassed. The highest altitude hitherto was that attained by the two Norwegian mountaineers who climbed Mount Kabru, 24,000 feet, in 1908. Besides making this ascent the expedition brought back an accurate survey of the Godwin-Austen Glacier and a large number of exact altitudes and measurements, besides a meteorological record of the region and several original observations, all of which will be contained in the full report.

America.

The Altitude of Mount Huascaran.—The following communication has been sent to us by Mrs. Fanny Bullock Workman:—

"In 1908 Miss A. Peck of U.S.A. claimed to have ascended the north (lower) summit of Mount Huascaran in Peru. She made no instrumental observations above what she considers to be an altitude of 5975 metres (19,600 feet), but, from eye-estimates only, asserted that this peak had a height of at least 7317 metres (24,000 feet), and was thus the highest mountain of South America.

"Believing Aconcagua to be the highest Andean peak, and wishing furthermore to test the truth of these assertions, I decided to have a careful detailed triangulation made of the two summits of Mount Huascaran. Through the assistance of Messrs. Fr. Schrader and Henri Vallot, acting for the 'Société Générale d'Études et de Travaux Topographiques' of Paris, an expedition was sent to Peru for me under the direction of M. de Larminat, to effect this purpose.

"Assisted by the Peruvian Government and also by favourable weather, M. de Larminat and his assistants were able to carry out this work successfully between August and November 1909.

"A base 1600 metres (5248 feet) long was measured in the Rio Santa valley in the Black Cordillera at an altitude of 3800 metres (12,464 feet). This base was measured by means of a 50-metre (164 feet) tape of Invar metal. From two stations, one at either end of this base, and from two others, the positions and altitudes of which were determined by trigonometrical measurements from them, that is from four stations in all, the positions and relative altitudes of the two summits of Huascaran were fixed by azimuthal and zenithal angles taken by theodolite.

"In order to ascertain the true height of these stations above average sea-level, a progressive levelling was conducted from the highest station, called the Garganta Signal, down along the mule-path leading from Yungay by way of Quillo to the sea at the port of Casma.

"The Garganta Signal is higher than the col where the path between Yungay and Casma reaches its highest point. The difference in height between these two was ascertained by triangulation from the Garganta Signal to be 159 metres (521·5 feet). From the col down to sea-level at the port of Casma the levelling was performed by means of the tacheometer. The altitude of the Garganta Signal being thus established, it was an easy matter to fix the altitude of the other three stations, from which the triangulation of the summits was made.

"From two of these stations, from which it was visible, the altitude of the church tower at Yungay was also established at 2568 metres (8432 feet).

"The average sea-level was determined by four double observations of two water-marks made at intervals of six hours, ten minutes between each. The agreement of these was satisfactory owing to the small amplitude of the tide at Casma, and also to the fortunate circumstance that the observations were made at time of neap tide.

"The results of these measurements show the height of the north peak of Huascaran to be 6650 metres (21,812 feet), and the height of the south peak 6763 metres (22,182 feet)."

Polar.

New Antarctic Expedition.—Lieutenant Filchner is to lead a German Expedition to the Antarctic in 1911. Full details are not yet available, but the plans of the expedition include a traverse of the Antarctic Continent from a base on the Weddell Sea to the coast of the Ross Sea. Lieutenant Filchner has already done important exploring work in Central Asia, and he is desirous rather of determining the shape of the Antarctic Continent than of reaching the Pole. His expedition is the fourth in active preparation at the present time.

New Arctic Expeditions.—Captain Amundsen has made some further arrangements in regard to his expedition (cf. xxv. p. 206). He

hopes to leave Norway this summer in the *Fram*, and after exploring work in the South Atlantic and South Pacific oceans, to arrive in San Francisco in the summer of 1911. Thence the vessel is to be headed north for the Bering Sea, where she will be allowed to become fast in the ice, in the hope of drifting close to the North Pole.

An Arctic Zeppelin expedition is being fitted out in Germany for the present summer. The object is to explore the unknown regions north of Franz Josef Land and Spitsbergen by means of the Zeppelin airship. Cross Bay is to be the airship base, and the Imperial exploration steamer *Poseidon* and the Norwegian iceship *Phœnix* are to be used for the purpose of the expedition in addition to the airship.

General.

The Royal Geographical Society's Awards.—Dr. Bruce's numerous friends will be glad to see that he has been awarded the Patron's Medal of the Royal Geographical Society for 1910 in recognition of his work in the Arctic and Antarctic regions. The Founder's Medal has been awarded to Col. H. H. Godwin Austen for his discoveries and surveys on the North-West Frontier of India. Mr. Douglas Carruthers receives the Gill Memorial for his work in Arabia, while the Murchison Grant goes to Dr. Carl Skottsberg, the Cuthbert Peek Grant to Lieutenant Fishbourne for his survey work in Central Africa, and the Back bequest to Mr. Hanns Vischer for his journey across the Sahara.

The Correlation of Climatic Variations.—M. Henryk Arctowski has published a pamphlet entitled *L'Enchainement des Variations Climatiques* (Société Belge d'Astronomie, Bruxelles, 1909), which, though of special interest to the meteorologist, may be briefly referred to here. The author has made a very elaborate and detailed study of the temperature variations for long periods over the surface of the globe, and where possible has recorded his results in the form of maps. He gives the name of *pleions* to the areas on these maps where the temperature for the period considered are in excess of the normal, and *anti-pleions* to those where the temperature is below the normal. The maps for successive annual periods show a very curious displacement of these pleions and anti-pleions, the movements appearing to start from certain centres. Although the investigation cannot be made complete on account of the absence of suitable figures, for certain areas the author believes that the following conclusions are well founded:—When the whole surface of the globe is considered it is found that there is variation in the amount of heat received from the sun from period to period, so that certain years show a total deficiency in the heat received, and others an excess above the normal. Owing, however, to the same causes which produce diurnal and seasonal variations in temperature, the excess or deficiency does not make itself visible at once over the whole surface. Certain areas appear to be specially sensitive, and from them waves of excess or deficiency (pleions and anti-pleions) radiate outwards. The most important of these centres

appear to be Greenland, tropical Australia, North America. Now it is upon the temperature variations from year to year over the lands that the crops and thus the price of food-stuffs depend, and therefore M. Arctowski's investigation suggests one line along which there is a possibility of finding a method of forecasting the weather on a larger scale than has yet been successfully attempted. But to do this more meteorological stations are required, and greater knowledge of the meteorological conditions, especially in Polar regions.

Delta Formation.—In the *Bulletin of the American Geographical Society* for December last, Mr. Arthur L. Smith describes a series of laboratory experiments, carried out with a view to throwing light upon the phenomena of delta formation. He summarises his results as follows. Two types of delta exist, those with regularly semi-circular outline, and those with irregularly lobate outline. The form in the first case was found to be determined by the maintenance of a constant or increasing stream gradient, and in the second by the decrease of the stream gradient. Finger-like outgrowths were found to be only surface features of the delta margin. It was found that neither the depth of the water nor irregularities in the lake-floors affected the form of the delta; but its shape was necessarily determined by the shape of the basin in which it was formed.

EDUCATIONAL.

In a review of certain recent Italian geographical books in the January issue of the *Bollettino della Società Geografica Italiana*, Prof. Goffredo Jaja returns to the often-discussed question as to the scope of geography. One of the books discussed is that on the Economic and Social Geography of Italy by Dr. Angelo Mariani. In the preface to this book its author lays down three propositions in regard to geography. The first is that social and economic facts are so intimately connected to what he calls the geographic factor, that the latter must be looked upon as the prime cause of the former. He therefore concludes that in the past the economists have erred in studying man and excluding the study of the environmental factor, just as the old geographers erred in studying the environment but omitting the study of man. The second proposition arises from the first, and affirms that true geography is the study which investigates geographical phenomena from the point of view of their relation to economic and social facts. In other words, the author regards the study of the physical environment as part of the great science of natural history—a term which in English has lost its general significance—geography being only the relation of this environment to man. Finally, he asserts that just as it is an error to confound the study of the physical environment with the study of geography, so it is an error to state that social and economic geography is a combination of geography and economics. In the strict

sense all geography is social and economic geography, for all geography involves a question of the relations between man and his environment. In other words, for Mariani all geography is anthropogeography.

In attacking this conception, Prof. Jaja naturally points out that Mariani's expression — the geographical factor — is unjustifiable. If geography is the study of relations, then it is improper to speak of the geographical factor, meaning the combination of physical, biological, etc., facts to be obtained from a study of the earth's surface. But this is not the only objection to Mariani's position. While it is clear that a primitive social polity may be more or less directly explained as the result of surrounding physical conditions, the more developed a state becomes, the less immediate is its dependence upon the local conditions. One may instance many mining communities, *e.g.* in the desert of Chile or in Western Australia, where the direct relation of community to surroundings is minimal. Prof. Jaja says that as man evolves he is more and more able to emancipate himself from environmental control. It seems to us truer to say that he is more and more able to extend his relations over a wider and wider area of the earth's surface, and thus emancipate himself from the control of the portion of the environment which immediately surrounds him.

But apart from these theoretical conceptions, Mariani's position is unworkable in practice. It may be, as he says, that descriptions of seas and rivers, mountains and plains, are not geography unless these are considered in relation to their effects upon man, but as we cannot consider their effects until we know their characters, the geographer must in point of fact describe them. It is certainly true that the geographer, as geographer, only requires such a description as will enable him to study the probable relations of surface phenomena to man's activities, but being human he is very apt, as we all know, to seek a complete description, and so encroach upon the territory of the geologist. In the reaction against this tendency, the anthropogeographers are liable, as Jaja points out, to commit another error, and to seek to explain the whole social and economic position of a people as the direct result of their environment.

The discussion at least makes clear the fact that at the present time there are two strongly opposing tendencies in geography. On the one hand we have those who, as Jaja says, wish to put a little of everything into their sack, taking over as it were the whole Universe. On the other hand there is the school which only seeks to find in the physical conditions an explanation of man in his social and economic relations. The practical difficulty with regard to the latter school is that it is necessary to have a new science to take over the study of what we now call physical geography, and with regard to the former is that geography becomes a mixture of all the sciences, natural and mathematical. It seems clear that the future must find a compromise between the two extreme positions, and Prof. Jaja suggests that the Geographical Congresses might usefully devote themselves to this task.

NEW BOOKS.

EUROPE.

Seekers in Sicily. By Elizabeth Bisland and Anne Hoyt. London: John Lane, 1909. *Price 5s. net.*

In a brief dedication at the beginning of the work the authors describe themselves as "a pair of word-braiders," and a perusal of its contents enables us to say that the description is just. The book is a sort of rhapsody. Two ladies from New York go to Sicily "on a quest for Persephone," *i.e.* to welcome Spring, and also to inspect the wealth of architectural remains, Carthaginian, Greek, Roman, Norman, Mediaeval, etc., which are to be found in that island. They equip themselves beforehand with a more than usually extensive acquaintance with the literature of their subject; and when viewing the remains they go off into rhapsodies, a strange mixture of learning and word-painting, or, as they call it, word-braiding. Now and then it gets a little wearisome, but, on the whole, it is well sustained. At intervals the strain is relieved by their intercourse with the inhabitants, who naturally take a more prosaic view of their surroundings. The ladies enjoyed their outing thoroughly, are adepts at description, and have embellished the book with many quotations and a few good photographs. Any of our readers who are thinking of going to Sicily would do well to peruse this book.

Highways and Byways in Middlesex. By Walter Jerrold. Macmillan and Co., Limited. London, 1909. *Price 6s.*

The author of this book is fain to confess that "it is not possible, to put it shortly, for one who has wandered in many countries, to expatiate on the beauties of the scenery of Middlesex as a whole"; yet he claims that there are beauties still available for those who care to search for them, *e.g.* short reaches of the Thames, quiet lanes and unshaded hayfields. And in this work he has certainly made the most of the somewhat scanty material on which he had to draw. But the main interest of the book consists in its historical and biographical allusions, and of these there is ample abundance. The reader is regaled with not very recondite, but very interesting, and often amusing information about such incongruous places as Hampton Court and Colney Hatch, Harrow School and Hounslow Heath; and about such incongruous persons as Cardinal Wolsey and John Wilkes, "Eclipse" O'Kelly and Charles Lamb. The author has collected a great number of notes regarding the historical, social, and political events connected with places situated in Middlesex, which cannot fail to interest the reader. As in other books of the series there is a profusion of excellent illustrations from the capable hand of Mr. Hugh Thomson.

Romantic Corsica. By George Renwick. London: T. Fisher Unwin, 1909. *Price 10s. 6d.*

A pleasantly written and well-illustrated description of an island which is coming gradually more into favour as a charming tourist resort, and which would become very popular were its beauties better known, were access to it by steamer improved, and were its country-inns made more suitable for modern travellers. The map which accompanies the book is taken from Baedeker, and has French lettering.

ASIA.

Wanderings among South Sea Savages, and in Borneo and the Philippines. By H. Wilfrid Walker, F.R.G.S. London: Witherby and Co., 1909. *Price 7s. 6d. net.*

In the course of twenty years the author has travelled and sojourned in many uncivilised parts of the world, into some of which he was the first white man to penetrate, and these papers tell of experiences in Fiji, the Philippines, Papua, and British North Borneo. Though birds and butterflies were his chief pursuit, he was always glad to meet a cannibal, and some of his details are not comfortable reading. But he has a quick eye for the beauty of scenery, and his narrative, written on the spot, is full of vivid incidents. One gains a fresh idea, for instance, of what service under the Rajah Brooke entails, but it would have been useful to have the date of the author's Borneo experiences stated. His account of a visit to the famous Gomanton Caves, which furnish the edible birds-nests, is of special interest. The book is well illustrated, and has a carefully-compiled table of contents and an index.

A New Account of East India and Persia: Being Nine Years' Travels, 1672-1681. By John Fryer. Edited by William Crooke, B.A., Bengal Civil Service (retired). Vol. I. London: Printed for the Hakluyt Society. 1909.

John Fryer, the writer of the curious and interesting letters which are the subject-matter of this book, was born, it is supposed, about the year 1650. He was educated at Trinity College, Cambridge, and graduated as M.B. in 1671. Next year he was appointed by the East India Company chirurgeon for Bombay, on the magnificent pay of fifty shillings a month, and he sailed for India in December. As his pay was to commence on his arrival he must have gone for a year without any, because, what with bad weather and Dutch enemies, the fleet did not arrive in Bombay till December 1673. In the first letter he describes the voyage, and what he saw at the various places where they touched, *e.g.* Ceylon, Masulipatam, Madras, and the coasts of Coromandel, Malabar, and the Carnatic. The second letter describes Bombay, Bassein, and Surat, and contains also a particularly interesting account of an embassy to the famous Sivaji in his fortress at Rairi. The third letter describes Surat, its appearance, customs, inhabitants, etc., and a visit paid by Fryer in his medical capacity to one of Sivaji's commandants in the hill-fort of Junnar, now in the Poona district. This volume contains these three letters; a second will contain the remaining letters, with Fryer's further experiences in other parts of India and in Persia. He was sent there early in 1677, and remained, mostly in Ispahan, till November 1678, when he returned to Surat to resume his work as chirurgeon to the factory. He returned to England in 1682, married a niece of General Desborough, and, in 1698, he published his letters, not so much on account of the "Importunity of some, as the Impertinencies of others; there being more than Four hundred Queries now by me, to which I was pressed for Answers, and wherein I found a necessity, if I declined this Work, to appear from other Hands in Print." He died in 1733. The interest of these letters lies in the transparently honest account which he gives of what he saw and heard, and in the quaint, though often stilted, language in which it is recorded. Much of what he describes is abundantly confirmed from other authorities. It is true, as the editor points out, that his travels were practically confined to the sea-board, and that he knew little about the Moghal empire save from meeting a few of its officials. But "in spite of these deficiencies, his work

is rightly described by Sir G. Birdwood as 'the most delightful book ever published on these countries, and invaluable for the graphic descriptions it gives of the factory life and general condition of the people of India in his time.' He was versed in all the learning of his age, and was specially interested in all questions connected with the natural sciences—the botany, zoology, geology, and meteorology of the lands which he visited. He paid particular attention to the scientific acquirements of the people of the East; and he naturally investigated with care their knowledge of medicine and surgery. He was a good Latin scholar, and had some knowledge of Greek. . . . The value of his investigations of their religions, customs, and folk-lore, made at a time when they had been little influenced by the West, cannot be overrated."

The work is published by the Hakluyt Society, and from the preface we learn that the duty of editing had been entrusted to Mr. Pringle of the Madras Civil Service. On his death it was made over to Mr. Crooke of the Bengal Civil Service, an acknowledged authority on the archæology and ethnography of India, who has also contributed an erudite and interesting introduction, from which we have condensed the foregoing sketch of Fryer's life. Mr. Crooke's notes are copious, but not discursive, and materially assist the reader unskilled in Indian languages and customs, and more especially those who have not read any of the contemporary records of those who travelled in India and Persia in the latter half of the seventeenth century.

A History of Sarawak under its Two White Rajahs, 1839-1908. By S. Baring-Gould, M.A., and C. A. Bamfylde, F.R.G.S. London: Henry Sotheran and Co., 1909.

Happy, we are told, is the nation that has no history, and if there is much truth in the proverb, then Sarawak might be one of the most unhappy nations under the sun, for during the eighty years of its history it has been the scene of many stirring events and much trouble. It is, as our readers know, a slice of territory on the north-west of the island of Borneo, very rich in natural resources, abounding in minerals, the home of the sago and pepper plants, and of many varieties of valuable jungle produce, such as rubber and camphor. Its curse has been the ferocious savagery of its inhabitants, to which must be added the misery caused by the incompetence, rapacity, and brutality of native rulers. The history of Sarawak under the two white Rajahs is the story of how the Brookes, uncle and nephew, transformed savage races, maddened and ruined by intertribal feuds, into peaceful and prosperous members of society, displaced the incompetent and brutal tyrants who had made Sarawak a hell upon earth, and substituted for them an enlightened, wise, and well-ordered system of government. Yet the history is at times far from pleasant reading. Sir James Brooke, the first Rajah, had to contend not only with multiform local difficulties and dangers, but with the incompetency, jealousy, and ignorance which prevailed at home, even in the Parliament, which contained such honoured names as Cobden, Sidney Herbert, and Gladstone. His vigorous and necessary measures to put down the piracy, which had paralysed commerce all along the Bornean coast and elsewhere, were described in such terms as these: "a human battue," "a massacre of harmless and timid people," truly a quaint description of the Sea-Dyaks, whose one ambition was to hunt "heads," and whose main, if not sole, occupation was piracy, slave-catching, and war. These were *par excellence* the days of the "little Englanders," and we must refer our readers to the book itself if they care to read a plain unvarnished tale of what befell a high-minded, philanthropic, English gentleman. "For over

twenty years his life had been full of anxiety, and had been a continual struggle against adversities, the most serious caused by the "malignant and persevering persecutions" of his own countrymen, to whom he had turned for a little sympathy and a little help, which would have cost England nothing. "In his policy and his actions he had been guided by no personal ambition; the great desire of his heart had been throughout the extension of British influence in the Far East, the improvement of trade, the suppression of piracy, the horrors of which he had witnessed, and the amelioration of the lot of the oppressed and suffering natives, whom he had come to love and esteem for their many good qualities." The obligations under which he placed Great Britain are summed up thus. Had his "policy not been discredited, Siam, the Sulu Archipelago, the whole of New Guinea, and a greater part of Borneo might now have been under British influence. To the Rajah's unaided efforts, frowned upon at home, England owes it that Sarawak, Bruni, and Labuan are not now Dutch Residencies, and North Borneo, through conquest from the Spaniards, an American colony." He died in 1868, and his character is portrayed by Dr. Russell Wallace, a competent authority, in these terms: "Though by those who knew him not he may be sneered at as an enthusiast, adventurer, or abused as a hard-headed despot, the universal testimony of every one who came in contact with him in his adopted country, whether European, Malay, or Dyak, will be that Rajah Brooke was a great, a wise, and a good ruler—a true and faithful friend, a man to be admired for his talents, respected for his honour and courage, and loved for his genuine hospitality, his kindness of disposition, and his tenderness of heart." The last chapters of the book are devoted to showing how his nephew, the present Rajah, now an old man of eighty, carried out the principles by which his uncle had achieved such notable results. They resemble to some extent the principles which have animated the Government of India for many years, viz.: "That the natives should, through their chiefs, have a full though subordinate share in its administrations and its councils; that their own laws and customs should be respected, though modified where necessary in accordance with the first principles of justice and humanity. That no sudden and wholesale changes disquieting to the native mind should be made, and that reforms should be very carefully considered from both the white man's and the native's point of view before being introduced, and that if carried out, it should be done gradually."

Kairo—Bagdad—Konstantinopel: Wanderungen u. Streifzüge. Von E. V. Hoffmeister. Leipzig u. Berlin: B. G. Teubner, 1910. *Price* 8 *marks.*

An interesting and instructive account of a four months' tour during the winter of 1907-8, *via* Egypt, Damascus, Palmyra, Bagdad, Mosul (Nineveh), Asia Minor, and Constantinople, beautifully illustrated, printed in clear Roman type, and accompanied by a good map and a special chapter on the Bagdad Railway. The author received much kindness from the Anglo-Egyptian officials, and expresses the hope "that the practical, sensible business mind of the British people, and the steadiness of their policy both in Egypt and in India will meet its reward in the midst of complications in both countries." He estimates the population of Bagdad at 250,000, and although Moslems both Turkish and Persian greatly preponderate, there are many Christians (Roman Catholics and Gregorian Armenians) and Jews. As is the case throughout the East, Christians and Jews occupy different quarters of the city. His chief object was to visit the Persian place of pilgrimage, Kerbela, which is as good as closed to most strangers, and lies 90 kilom. SW. of Bagdad, and afterwards the excavations of Babylon. The two great mosques at Kerbela are magnificent specimens of Persian architecture, and made a deep impression upon

him. At Babylon he was warmly received in the "German House" by Professor Koldewey, the Director of the Excavations. Immediately behind the "German House" lay, under a mound, the palace of Nebuchadnezzar (B.C. 604-561). Professor Koldewey guided him as he inspected the remains of Babylon. Then he returned to Bagdad, which, when connected with Constantinople, Salonika, and Smyrna, will, he believes, become the greatest commercial city in the Ottoman Empire. From Bagdad he travelled to Assur and its "German House," and stayed with Herr Jordan, the Director of the Excavations. Then he proceeded to Mosul (Nineveh), after which he struck across a wild country to Tarsus, St. Paul's birthplace, now containing a small population, chiefly of Greeks and Armenians. Finally he reached Bulgurlu, the furthest south station yet constructed on the Constantinople-Bagdad Railway, and found the line very good, indeed "musterhaft gebaut," with nice stations, and chiefly German, Austrian, and Swiss officials, and thus he reached Constantinople.

Dawn in Toda Land: A Narrative of Missionary Effort on the Nilgiri Hills, South India. By C. F. Ling. With a Foreword by Amy Wilson Carmichael. London: Morgan and Scott, 1910. *Price* 1*s.* 6*d. net.*

This little book is sufficiently described by its sub-title. It has some good illustrations, and gives incidentally some account of the life and customs of the Todas.

The Thousand and One Churches. By Sir W. M. Ramsay and Miss Gertrude L. Bell. London: Hodder and Stoughton, 1909. *Price* 20*s. net.*

The subject of this interesting and profusely illustrated book is the ruins of a city on a valley sloping up one of the mountains of the Kara Dagh range in Lycaonia in Asia Minor. So long ago as 1882 these ruins had attracted the attention of Sir William Ramsay, whose antiquarian researches in Asia Minor have secured for him a world-wide reputation; but it was not till 1907 that, accompanied by Miss Gertrude Bell, he revisited the ruins, and made them an object of detailed study. Miss Bell had visited them in 1905. "The site" of the ruins, says Sir William, "is one of unique interest. As stated in my letter to the *Athenæum*, the city is Late Byzantine, but the churches are of all ages, from the fifth to the eleventh; and our work has fully justified the words there used, 'that the proper exploration of Bir Bin Keleger and Deghile (the city of the valley and of the hill) is urgently needed in the interests of Byzantine history and of Christian architecture.' Nowhere else can one find Church development through so many centuries exhibited on one ruined site in such clear and well-preserved examples." From these words our readers can gather that the scope of the book is in no way geographical. It is rather antiquarian and ecclesio-architectural, and for those interested in these studies it will have a very special value. Miss Bell is responsible for the greater part of the work, which is devoted to a detailed description of the twenty-eight churches and other buildings from which the present name of the valley, Bir Bin Keleger, is derived. Sir William Ramsay contributes the preface and the first and last chapters, in which he sets forth with his well-known erudition and clearness what can be known of the ruins from a study of records, inscriptions, and antiquarian remains.

AFRICA.

Les Civilisations de l'Afrique du Nord. Par Victor Piquet. Paris: A. Colin, 1909. *Price* 4 *francs.*

The author published this volume because "no work has yet given the general public a picture of the successive civilisations of the countries called Tunisia,

Algeria, and Morocco," learned works and documents written in Arabic being as yet the only means of information. He divides the History of Northern Africa into three periods. 1st. That of the Berbers (Libyans, Numidians, and Moors) until the arrival of the Arabs ; 2nd. That of the Berber Mussulmans until the establishment of the French ; and 3rd. The work of the French in Africa. He insists that from an ethnographic as well as historical point of view the whole territory under notice was originally the land of the Berbers, and that scientific writers have mistakenly described the antiquities of Algeria without even mentioning those of Tunisia, the cradle of the successive civilisations of Northern Africa. He considers it important to remember that "Carthage was never anything else but a Counting-house of foreign merchants in the midst of the natives." He points out that the doctrine of Islam owed its origin to political strife, and cannot be compared with the peacefully propagated gospel of Christ. It was not Mussulman fanaticism, but a mixture of politics and religion which enabled the Arabs to conquer the land of the Berbers. The author examines with much minuteness and erudition the history and characteristics of the peoples of Northern Africa, and illustrates his subject with four maps of great ethnological value. He does not mention that, while the Carthaginians employed the native Africans to develop Tunisia, the French employ Sicilians and Maltese. He says that the remains of Carthage consist only of a "deep bed of ashes," but he forgets the massive waterworks still in operation.

The Gateway to the Sahara : Observations and Experiences. By Charles Wellington Furlong, F.R.G.S. London : Chapman and Hall, Ltd., 1909. *Price* 12*s.* 6*d. net.*

Tripoli is, says Mr. Furlong, the only Mohammedan-ruled state in Northern Africa, the last Turkish possession in that continent, and it must be allowed that he has furnished the reader with an account of this barbaric land of more than usual merit. Tripoli the town and Tripolitania the province form the point where the three great trade routes across the desert terminate. It lies well back from the usual commercial routes of the West, and this, combined with the fact that the country is under Turkish domination, has contributed to preserve its full oriental and ancient aspect. The author, after glancing at the history of the migrations of the tribes along the coast, and their succeeding submergences, gives a most interesting account of the great industries of the country, the sponge trade, esparto, and the great caravans of the Sahara. It will be new to many of us to read of the terrible conditions to which the divers are subject, the disease which attacks practically every one who continues the occupation long enough. But perhaps attention will centre on the account of the caravan routes from Tripoli to Kano, Timbuktu, and other places on the other side of the Great Sahara, the last remnant of a trading method which obtained in Old Testament times. Let the reader conceive a route which takes two years to traverse amidst constant dangers ; of a caravan containing thousands of camels, valued at several millions of dollars, and which take the best part of a day to pass any given point. The author's photographs are excellent, and we can only admire the patience and persistence with which he secured for us photographs of such unpleasant subjects as the Tuaregs. Tripoli is as yet hardly a resort for the ordinary tourist.

AMERICA.

Au Pays de l'Or, des Forçats et des Peaux-Rouges. Par le Docteur J. Tripot. Deuxième édition. Paris : Librairie Plon, 1910. *Prix 4 francs.*

In June 1907 the Geographical Society of Paris despatched an expedition to

French Guiana to explore the two rivers, Itany and Arawa, which are tributaries of the Maroni, and have their sources in the chain of mountains called Tumac-Humac, which is the boundary between Brazil on the one side, and French and Dutch Guiana on the other. Dr. Tripot, the author of this very interesting work, was deputed to explore the region of the Itany, more especially with reference to its fauna, flora, mineralogy and ethnography. The expedition arrived at Cayenne in the end of June, and went on to St. Laurent without delay. On the 24th July they started up the Maroni river, and the two parties separated at the confluence of the Onaqui and the Arawa about a month later. Dr. Tripot and his colleague Dr. Saillard, who unfortunately soon became seriously ill with malarial fever, proceeded to ascend the Itany in two canoes manned by Roucouyennes, a branch of the Carib Indians, through whose lands the Itany flows. The volume now before us sets forth Dr. Tripot's impressions and observations during his journey. His expedition was successful in reaching the source of the Itany after some months of very arduous work, often having literally to cut their way through dense and sometimes impenetrable forest. The dangers which they encountered were mainly those of the climate, which, to Europeans, is a hotbed of malarial fever, and to these must be added dangers from an extraordinary variety of insects, reptiles, such as serpents and crocodiles, and also poisonous fishes, and, last but not least, from falling trees. They had also to deal with various tribes of savage Indians, and much of the interest of the book lies in the careful and detailed observations which Dr. Tripot has put on record regarding their strange customs, religion, magic, rules of inheritance, methods of hunting and fishing, their marriage and funeral ceremonies, their methods of seeking for and treating gold, etc. The country traversed abounds in fish, game of all sorts, so the members of the expedition were never in difficulty from want of food. Our readers may be amused at Dr. Tripot's account of his fare:—"Notre table, alimentée au jour le jour par la chasse, fut des plus variées et des mieux pourvues pendant notre parcours en ce pays où toutes les espèces de gibier abondent. Dans nos casseroles affluèrent les produits les plus étranges et les plus disparates de la création: depuis l'aigrette immaculée en sa blancheur de neige, jusqu'aux perroquets et perruches les plus rares; depuis la lente tortue et le tatou impur et écailleux, jusqu'aux singes les plus bizarres; petits tamarins à tête de lion, macaques à grimaces de juge, sagouins malicieux et malpropres, aïs et unaus au poil laineux et à la lenteur proverbiale, d'où le nom de 'moutons paresseux' sous lequel ou désigne encore ces primates singuliers aux longs bras indolents et griffus, au masque stupide d'idiots figés dans un perpétuel étonnement." We may add that the flesh of the koata ape is much preferred by the Indians because it recalls and smells like *human flesh!* Dr. Tripot seems to have had no difficulty in ingratiating himself with the natives, and he has reproduced some of their folklore, more especially the strange and quaint legends, in which they describe the origin and creation of the human race. He found on the banks of the Itany a legend, which is also found in British India and various parts of Africa, viz, that there is a plant known to and used by snakes which is an antidote to their own poison. Apparently he believes it, for he tells us "les Bonis m'affirmèrent qu'après de tels conflits, le vainqueur s'éloigne et se met à la recherche d'une herbe qu'il mange en toute hâte avec avidité, pour neutraliser le venin de ses propres blessures, puis, généreux dans la victoire, il revient auprès du vaincu et bave sur les plaies de son adversaire mis à mal, le suc mastiqué de ces mêmes plantes, le ranimant et le ressuscitant tout d'abord, quitte à lui infliger de nouvelles avaries par la suite."

One of the most interesting, and yet a painful chapter in the book, is that in which Dr. Tripot describes the life and conditions of five thousand criminals—

the scum of France—who have been deported to the colony, and, remaining there, constitute a perpetual plague-spot and menace to society. We gladly recommend this book to the attention of our readers.

Mexico: The Wonderland of the South. By W. E. Carson. New York: The Macmillan Company, 1909. *Price* 10*s. net.*

We have in this volume a very delightful and vivid account of six months spent in wandering through the ancient land of the Toltecs and the Aztecs. The author traversed the country from Tehuantepec to its northern boundary, and reached westwards to Guadalajara, the "Manchester" of Mexico. He has been a very close observer of the life and scenes of this land of strange contrasts, and has depicted what he has seen in a very fresh and charming manner. Whether he is describing a railway journey through the Oaxaca Valley or a scene in the streets of the capital, a sunset at Cuernavaca, or the crater of Popocatepetl, the life of the cowboys on a northern ranch, or of the gold-diggers at Zavaleta, the visionary from the West "with a scheme," or the white man's burden-bearer, the writer is always interesting and instructive.

The book is enlivened with some delightful stories, which are put to excellent use, and often reveal the character of the people of whom they are told. The mendicant, whose pride would not allow him to accept anything less than ten centivos, stirs our sympathy as well as our laughter. While the author has no great admiration for a certain type of English tourist who makes himself obnoxious on the Continent, he has no greater love for the type of his own countrymen, exemplified in the "elderly American woman, thin, wiry, and determined," who guessed that "some of our young men from the Tec" meaning "the Technological Institootion of Chicago" could have given a few wrinkles to the builders of the ancient monoliths at Mitla, and might have taught the ignorant Toltecs how to rear sky-scrapers.

But the book is much more than merely entertaining. The author has evidently obtained a very considerable insight into Mexican affairs, and has much to say about the political and material progress of the country. During the last quarter of a century Mexico has advanced rapidly; old and sleepy Mexican towns have been transformed into busy cities, with the most modern equipment; the Indian with his burro is to be found side by side with the latest American motor car: with the installation of electric light some of the most criminal quarters of the great towns have been removed; plague spots have been cleared; railways and roads have been extended; a national system of education has been organised: Mexico has become a commercial nation. The author rightly attributes the greater part of this progress to the rule of "Mexico's great dictator," Porfirio Diaz, who has occupied the office of President since 1884. Perhaps the most significant thing about Mexico's prosperity is that the country is gradually becoming Americanised. Examples of this tendency meet one everywhere, in the newspapers with their sensational headlines, in the electric cars, and especially in the shops. The majority of the great schemes are financed by American capital, and the author hazards the opinion that within twenty-five years the United States of Mexico will have become part of the United States of America. In the race for commercial supremacy in Mexico, Germany is America's most powerful rival. "German drummers are encountered almost everywhere, all of them speaking Spanish fluently. The catalogues of German firms, too, are always printed in Spanish, the prices given in Mexican currency, and the goods are specially designed for Mexican trade. British trade was once supreme in Mexico, but owing to lack of

proper methods on the part of English firms this proud position has long been lost." It is a slight consolation to learn that while our position has declined, that of Canada has steadily increased, as is shown, for example, by the fact that the company which supplies the capital with electricity is a Canadian concern.

Among the many excellent chapters in the book reference can only be made to those dealing with Mexico from the historical point of view, to the description of the Tarpon fishing at Tampico, and to the account of the Titian in the parish church at Tzintzuntzan, once the capital of the Tarascan kings, but now a straggling Indian village.

AUSTRALASIA.

With the Flag-ship in the South. By C. E. W. Bean. London: T. Werner Laurie, 1909. *Price* 2*s.* 6*d. net.*

This little book describes a voyage on a British warship, and is for the most part made up of articles which appeared in the *Sydney Morning Herald.* It gives a vivid description of life on a warship, but naturally the geography contained in it is merely incidental. There are, however, interesting accounts of Fiji and Norfolk Island.

POLAR.

Die Polarwelt und ihre Nachbarländer. Von Otto Nordenskjöld. Leipzig und Berlin: B. G. Teubner, 1909. *Price* 8 *marks.*

This book had its origin in a course of popular lectures, delivered before the University of Gotenberg during the winter of 1907. The original popular form is retained, and the result is a very readable volume. It is profusely illustrated, containing 77 reproductions of photographs, mostly taken either by the author himself or by members of expeditions under his direction. The book is well got up, and is a good example of the work of Teubner's firm.

Although it cannot lay claim to any outstanding graces of language or style, the volume gives a very interesting account, within comparatively brief compass, of the conditions prevailing in the polar regions, both North and South. The author claims that while most of the literature of the subject already published lays the chief stress on descriptions of the personal adventures of explorers, or on the purely human element in polar discovery, his own book will be found to provide an account of polar nature, starting with the all-important factor of climate, and describing the ice, the countries, the active forces, and the fauna and flora of these regions. He has certainly been as good as his word. His eight chapters deal with Greenland, Iceland and Jan Mayen, Spitsbergen, the South Polar lands, the sub-Antarctic lands, North America, Siberia, North-West Europe. In the case of each of these he touches on the geology, the climate, the botany, the zoology, the political history, and gives a vivid sketch of the conditions actually prevailing. He breaks a lance with Nansen and Hamberg, and other workers in the same field, and is evidently well up in all that has been done by other explorers. Like all his predecessors, he has much to say in praise of the policy which has been followed by Denmark in those polar countries which are under her sway, and is confident of a bright future even for Greenland and Iceland. Amongst the Eskimos he found schools, conducted by native Greenlanders. The children study "pretty much the same as in elementary schools elsewhere, and with pretty much the same result." "A journey to Spitsbergen is nowadays less dangerous and much more comfortable than a summer tour in the more distant parts of Sweden or Norway. It is becoming more and more a land for tourists, where thousands

of people can get for once in their lives a look into the strange polar world." While the book contains much that is of general interest, it is evident that the author's main strength has been given to the geology of the various polar regions he has visited, and to the problems which are connected with that aspect of his subject.

Die Polarvölker. Von Dr. U. Byham. Mit 16 Tafeln und 2 Karten. Leipzig: Quelle und Meyer, 1909. *Price* 1 *mark* 25.

We have already had occasion to remark favourably on this excellent little series. The present volume gives a very comprehensive account of the races inhabiting the Arctic area. The book begins with a description of the conditions of existence, and then we have the individual races, their clothing, weapons, methods of building, trade and industries, social polity, religion, etc., all described. There is a list of books and sixteen excellent plates—altogether a wonderful bargain for the price! The only criticism we have to make is that the German characters in such small print are very trying to the eyes, but perhaps patriotism forbids the use of Roman type.

GENERAL.

An Introduction to Military Geography. By Brigadier-General G. S. May, C.B., C.M.S. With Maps and Sketches. London: Hugh Rees, 1909. *Price* 8*s.* 6*d. net.*

This book is an elaboration of the author's previous book called *Geography in Relation to War.* It contains thirteen chapters which discuss such subjects as Artificial and Natural Frontiers, Lines of Communication, including existing waterways and railways, and those in process of construction and projected, Sea-power, and so forth. A series of chapters then follows dealing with Persia, Afghanistan, Abyssinia, and Manchuria, as countries of special interest to military men. As is natural under the circumstances, the book often leaves the domain of geography proper for that of politics and strategy, and is thus primarily of interest for those for whom it was specially written. But others will also find its clear and lucid descriptions of value. It is adequately illustrated by maps and sketches.

Handbuch der Klimatologie. Von Dr. Julius Hann. Band iii. Klimatologie. 1 Teil. Klima der Tropenzone. Dritte, wesentlich umgearbeitete und vermehrte Auflage. Stuttgart: Engelhorn, 1910. *Price* 14 *marks.*

We noted here (xxv. p. 276) the appearance of a third enlarged edition of Dr. Hann's invaluable climatology. The present volume, which deals with the climate of tropical regions, shows as extensive alterations and improvements as did vol. i., and thus illustrates the rapid progress which has been made in the science since the appearance of the former edition. As in the case of vol. i. also, the addition of an index enormously facilitates reference. A third volume is still to appear.

The Scholars' Book of Travel. In Four Parts: 1. The British Isles. 2. Europe. 3. Other Lands. 4. The British Empire. London: George Philip and Son, n.d. *Price* 1*s.* 3*d. each part.*

The volumes of this new geographical series are made up of long extracts from books of travel and similar works, and are meant to be used in supplementing the geography lesson. Each extract is more or less complete in itself, and many are

well-selected and good. The idea has much to recommend it, but we note in this as in some other recent publications that publishers do not sufficiently realise that even school-books must be edited by trained and competent persons. We have marked in parts 1 and 2 a whole series of errors in the explanatory footnotes, errors ranging from mistranslations of foreign words to the most childish mistakes in the definition of scientific terms. If the series is to be extensively used in schools, these footnotes must be revised by some one having a sound knowledge of geography and the related subjects.

On Sea and Land. By HENRY W. CASE. London: Morgan and Scott, Limited, 1909. *Price* 5*s.*

This book purports to be an "account of experiences in the visitation of assemblies of Christians in the West Indies and British Guiana; with reminiscences of pioneer missionaries, and of the slave-trade formerly carried on from Bristol," and this being so, its contents do not lend themselves readily to review in a geographical magazine. Incidentally the author gives us many glimpses of life in the West Indies and British Guiana, and an account of several of the dangers and discomforts incidental to travelling there. One attraction of the book is the numerous photographic illustrations. It will be acceptable to those who are interested in missionary enterprise in the West Indies.

BOOKS RECEIVED.

En Haiti: Planteurs d'autrefois, Nègres d'aujourd'hui. Par EUGENE AUBIN. Un fort volume in-18 jésus. 32 Phototypies et 2 Cartes en couleur hors texte. Pp. xxxv+348. Paris: Librairie Armand Colin, 1910. *Prix* 5 *fr.*

The Land of the Lion. By W. S. RAINSFORD. Illustrated by Photographs. Demy 8vo. Pp. xxiv+459. London: Wm. Heinemann, 1910. *Price* 12*s.* 6*d. net.*

La Grande Boucle. Par MAURICE RONDET-SAINT. Un volume in-16. Pp. vi+314. Paris: Plon-Nourrit et Cie, 1910. *Prix* 3 *fr.* 50.

Die Stellung der Pygmäen-völker in der Entwicklungsgeschichte des Menschen. Von P. W. SCHMIDT. Gross-Oktav. Pp. 320. Stuttgart: Strecker und Schröder, 1910. *Preis* 9.60 *M.*

The Garos. By Major A. PLAYFAIR, I.A. With an Introduction by Sir J. B. FULLER, K.C.S.I., C.I.E. Demy 8vo. Pp. xvi+172. London: David Nutt, 1909. *Price* 7*s.* 6*d. net.*

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This first division of the land into allotments is an interesting feature on these maps. Otherwise, even on the one-inch scale, there is practically nothing else to map except the contour of the hills, the occasional rivers, and patches of scrub.

GOLD COAST.—General Staff Map on Scale 1 : 250,000 or about 4 miles to an inch. Sheet 72 Q, Tarkwa. 1909. Price 2s. net.
Geographical Section, General Staff, London.

NORTHERN NIGERIA.—General Staff Map compiled in the War Office from Boundary Commission surveys and road traverses adjusted on certain towns fixed by latitudes and telegraphic longitudes. Scale 1 : 2,000,000 or about 32 miles to an inch. 1909. Price 3s. net.
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SOUTHERN RHODESIA.—General Staff Map reduced from a map compiled in the Office of the Surveyor-General, Southern Rhodesia. Scale 1 : 500,000, or about 8 miles to an inch. Sheets,—Bulawayo, Gwelo, Salisbury, Umtali, Urunqwe, Victoria, Victoria Falls. 1909. Price 2s. net each sheet.
Geographical Section, General Staff, London.

These maps show all the farms and mining allotments.

RAILWAY MAP OF SOUTH AFRICA, 1910.—Scale 65 miles to an inch. Price 2s. 6d. mounted on cloth.
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A new edition of this well-known map revised to date.

DEUTSCH-SÜDWESTAFRIKA. — Massstab 1 : 2,000,000. Bearbeitet von Paul Sprigade und Max Moisel. Mit ausführlichem Namenverzeichnis. Price, unmounted in cover, M. 5. *Dietrich Reimer (Ernst Vohsen), Berlin.*

This is a complete and minutely drawn map of German South-West Africa. It is substantially the same as the one by the same authors in the *Grosser Deutscher Kolonial-Atlas*, but with revision to present date.

TROPICAL AFRICA. — Skeleton Maps showing Distribution of Tsetse-Flies and Sleeping Sickness. Scale 1 : 7,500,000. With Notes and Bibliography. Issued under the direction of the Honorary Managing Committee, 1909.

These maps represent the beginning of a systematic record of the distribution of the various species of the *Glossina* or Tsetse-Fly and their relation to the distribution of cases of Sleeping Sickness, with the area of which they more or less correspond. *Sleeping Sickness Bureau, Royal Society, London.*

ATLASES.

ATLAS COLONIAL PORTUGUÊS. — 2ª Ediçao Reduzida, 1909. Ministerio da Marinha e Ultramar. *Commissao de Cartographia, Lisboa.*

A series of twelve small maps on varying scales showing Portuguese possessions in Africa and Asia.

A SCHOOL ECONOMIC ATLAS. By J. G. Bartholomew, LL.D., with Introduction by L. W. Lyde, M.A., Professor of Economic Geography in University College, London. A series of over 180 coloured maps and diagrams. Demy 4to. Price 2s. 6d. net. *The Clarendon Press, Oxford.*

As an atlas of Commercial Geography specially designed for the use of schools, this work is perhaps more complete than anything hitherto attempted. The first seventeen plates are devoted to world maps and show the general distribution of physical, political and commercial features with supplementary statistical diagrams. The continents are then dealt with separately, and the various countries are mapped in all their physical and economic aspects—orography, climate, vegetation, population, industries, etc. Lastly comes a series of thirty maps dealing with the distribution and comparative production of the various commodities of commerce. The introduction by Professor Lyde describes the maps and draws attention to points worthy of special notice.

THE SCOTTISH

GEOGRAPHICAL

MAGAZINE.

EXPLORATIONS IN CENTRAL ASIA, 1906-8.[1]

By Dr. M. Aurel Stein.

(*With Illustrations.*)

Ever since, in 1901, I had returned from my first journey into Chinese Turkestan happy recollections of congenial labour spent in its mountains and deserts had made me long for a chance of fresh explorations. There was reason to hope that the ruins of sites long ago abandoned to the desert would yield more relics of that ancient civilisation, which as the joint product of Indian, Chinese, and classical influences had once flourished in the Tarim Basin and upon which it had been my good fortune to throw light by my former excavations. But the elaboration of the scientific results of that expedition by the side of exacting official duties took time, and so also the efforts needed to secure freedom and the means for a fresh journey. At last, in 1905, these were assured to me when the Government of India, then under Lord Curzon as Viceroy, liberally sanctioned my proposed explorations, and agreed to bear their cost, helped by a generous contribution of two-fifths from the British Museum Trustees.

A kindly Fate has allowed me to carry through my archæological tasks and the geographical explorations which formed from the outset part of my programme in their entirety and with abundant results. But their very extent, which is sufficiently indicated by the length of the time spent over constant work and travel, two years and eight months, and by an aggregate marching distance of about 10,000 miles, make it difficult at the present stage to give anything more than a rapid survey. Even this would probably take double or treble the time here available; so I must restrict myself to presenting mere extracts likely to show the character of the work accomplished and the type of the personal

[1] An address delivered before the Society in Edinburgh on Jan. 27, 1910.

experiences which accompanied it. For my entry into Chinese Turkestan I had chosen this time a route singularly interesting to the student of early geography and ethnography, but practically closed now to the European traveller. It was to take me from the Peshawar District, the ancient Gandhāra, through the independent tribal territory of Swat and Dir into Chitral and thence to the Upper Oxus Valley and the Afghan Pamirs. My lamented late chief, Sir Harold Deane, that truly great Warden of the Marches, had readily agreed to my project, and his Majesty the Amir of Afghanistan, too, had granted me permission to cross that portion of his territory not visited by any European since the days of the Pamir Boundary Commission. But the difficult Lowarai Pass, then deeply buried under snow, still interposed a formidable barrier. So it was not until the 28th of April 1906 that I was able to leave Fort Chakdarra, the scene of such hard fighting during the last great tribal rising. In the meantime I had been joined by my Indian assistants, Rai Ram Singh, the excellent native surveyor who had accompanied me on my former journey, and by worthy Naik Ram Singh, a corporal of the First Sappers and Miners, who was to act as my "handy man."

My journey was to take me not to distant regions alone but also far back in the ages. So it was doubly appropriate that its first stages should lead through trans-border valleys which twenty-two centuries ago had seen the conquering columns of Alexander pass by, and which still display in plenty ruins of Buddhist times. May 3rd found us at the foot of the dreaded Lowarai Pass (10,400 ft.), and our crossing effected before daybreak through gorges deeply choked with the snows of avalanches, some quite recent, showed that the difficulties had scarcely been exaggerated. With this obstacle once safely overcome I could rapidly push up the deep-cut valley of the Chitral River to Fort Drosh, and thence, with the huge icy mass of the Tirich-mīr Peak (over 25,400 ft.) in full view northward, to the Chitral capital. During the few days of halt there I was able to gather an ample anthropometrical harvest. In its autokhthon population Chitral holds an important branch of that "Dard" race, which by its antiquity and ethnic and linguistic affinities may well claim the special interest of the historical student and ethnographer.

The survival of much ancient lore in customs, traditions, crafts, and even in domestic architecture make Chitral and the adjacent valleys a fascinating field for the student of early Indian civilisation. It was with regret, therefore, that I yielded to a variety of cogent practical reasons urging me onwards to the Oxus and the "Roof of the World."

I was soon able to verify the accuracy of those Chinese annalists who are our chief guides in the early history and geography of Central Asia, by tracing the route over the Baroghil and Darkot Passes by which in 747 A.D. a Chinese army coming from Kashgar and across the Pamirs had successfully invaded the territories of Yasin and Gilgit, then held by the Tibetans. It was a remarkable exploit considering the formidable natural barriers which the Pamirs and Hindu-kush present to military action. The ascent of the Darkot Pass (*circ.* 15,200 ft. above the sea; see Fig. 1), which I undertook with this object on May 17th, proved a

very trying affair; for the miles of magnificent glacier over which the ascent led from the north were still covered by deep masses of snow, and only after nine hours of toil in soft snow hiding much-crevassed ice did we reach the top of the pass.

On May 19th we crossed the Hindu-kush main range over its lowest depression, the Baroghil. Owing to the abnormally heavy snowfall of that year, the masses of snow on it were so great that but for the timely assistance sent from the Afghan side on the Oxus it would have been quite impossible to get our loads across. At Sarhad, the highest village on the Oxus, the kindest reception awaited me. Colonel Shirin-dil Khan, commanding the Afghan frontier garrisons from Badakhshan

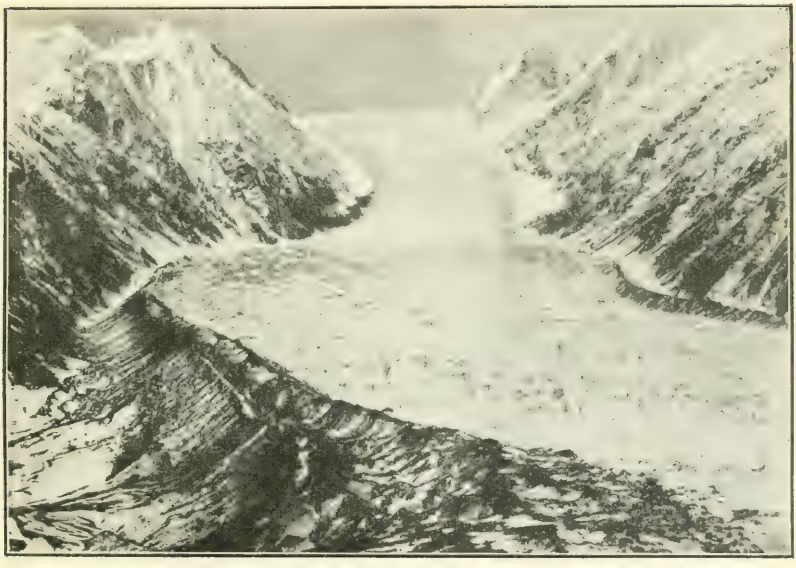


Fig. 1.—Glacier near Darkot Pass.

upwards, had been sent up weeks before with an imposing escort. The presence of this delightful old warrior, who had fought through all the troubled times preceding and immediately following Amir Abdurrahman's accession, would alone have been an inducement to tarry by the Oxus: for I found him not only full of interesting information about ancient remains in Badakhshan and old Bactra, but himself also as it were a fascinating historical record. Was it not like being shifted back many centuries to find myself listening to this amiable and gentlemanly old soldier, who in his younger days had helped in building up pyramids of rebel heads just to establish order in the time-honoured fashion of Central Asia?

Our marches up the Oxus were exceptionally trying owing to the fact that the winter route in the Oxus bed was already closed by the flooded river, while impracticable masses of snow still covered the high

summer track. Again and again only the incessant watchfulness of our Afghan escort saved the baggage from bounding down into the river. It was the uppermost course of the Ab-i-Panja which brought us on May 27th to the foot of the Wakhjir Pass (16,200 ft.) and the glaciers where Lord Curzon has placed, I think rightly, the true source of the Oxus. A long day of toil saw us crossing the pass, and with it the Afghan-Chinese border. We started by 3 A.M. after a hearty farewell to the kindly Afghan colonel. Enormous masses of snow still covered the Wakhjir, and it was not until midnight that I found rest at the first point on the Chinese side, where fuel and a dry spot to lie down on were available.

Moving down the Taghdumbash Pamir I found myself once more on the ancient route which Hsüan-tsang, the great Chinese pilgrim, had followed when returning in 642 A.D. from his long travels in India. I was able to identify here the ruined rock fastness where a curious local legend related by the pilgrim supposed an imperial princess from China to have been imprisoned in ancient days.

I was still on Hsüan-tsang's track when I moved from Sarikol by a succession of rapid marches across the high Chichiklik Dawan and a succession of minor passes to Kashgar. There under the hospitable roof of my old friend Mr. Macartney, now H.M.'s Consul, a host of practical tasks connected with the organisation of my caravan kept me busy for a fortnight. Mr. Macartney's kind offices were of great help in securing the goodwill of the provincial Chinese Government for my fresh explorations. But it was a service of quite as great importance when he recommended to me a qualified Chinese secretary in the person of Chiang-ssŭ-yieh. For the tasks before me the help of a Chinese scholar had appeared from the first indispensable. It was a piece of real good fortune which gave me in Chiang-ssŭ-yieh not merely an excellent teacher and secretary, but a devoted helpmate ever ready to face hardships for the sake of my scientific interests. With the true historical sense innate to every educated Chinese, he took to archæological work like a young duck to the water.

When on June 23rd I started from Kashgar, Khotan was my goal. But owing to the great summer heat of the plains the work of exploring ancient sites in the desert could not be thought of until September. So I was free in the meantime to turn my attention to geographical and other tasks. Thus at Kökyar, at the foot of the Kun-lun, I was busy collecting anthropological measurements and data about the little-known people of Pakhpo. This small semi-nomadic hill tribe in its alpine isolation proves to have preserved remarkably well the main physical features of Homo Alpinus type which in ancient times appears to have extended right through to Khotan and even further east.

By a little-known route leading through the barren outer hills I made my way to Khotan by the beginning of August. A few days among my old haunts in this flourishing great oasis sufficed for putting myself into touch with the local Chinese authorities and setting on foot inquiries likely to guide me in my subsequent archæological research. Then I set out with Ram Singh for the high Kun-lun range south of Khotan in order to supplement our surveys of 1900 by ampler topographical details about

the great glaciers which feed the head waters of the Yurung-kash. Pushing up rapidly we reached the Nissa Valley after the middle of August, and were soon busily engaged mapping the huge ice-streams which descend towards its head both from the main Kun-lun watershed and the great side-spurs (Fig. 2).

The effects of far-advanced disintegration of rocks were everywhere most striking. The precipitous ridges we had to climb for the sake of survey stations were composed on their crests of nothing but enormous rock-fragments heaped up as by the hands of Titans and quite bare of detritus from *circ.* 14,000 ft. upwards. Enormous masses of rock débris sent down from these ridges almost smothered the ice-streams below.

Fig. 2.—Kashkul Glacier above Nissa Valley.

Even near big ice-falls and gaping crevasses the exposed ice surface looked almost black, and when on the Otrughul glacier I had under serious difficulties clambered up to an elevation of *circ.* 16,000 ft., the reaches of clear ice and snow descending in sharp curves from the highest buttresses of a peak over 23,000 ft. high, seemed still as far away as ever. The barrenness of the valleys below was great, and the bleak steep slopes of rock or detritus told plainly the story of rapidly progressing erosion. The melting of the glacier ice was still proceeding at a great rate, and the flooded condition of the streams was a great source of trouble and risk in the deep-cut gorges.

In addition to these difficulties of nature we had to contend with much wily obstruction on the part of the few semi-nomadic hillmen and select malefactors exiled from Khotan, who form the only population in this desolate mountain region, and upon whom we depended entirely for

supplies, transport and guides. Fortunately these and similar obstacles did not prevent us in the end from clearing up many interesting details of orography in the rugged ice-covered main range rising south of the Yurung-kash.

By September 9th I had returned to Khotan, and after a few days I started my archæological campaign in the desert adjoining the oasis north-eastward. While surveying extensive débris-strewn areas north of Hanguya, once thickly populated and now abandoned in the desert, I had the satisfaction of recovering by excavation a mass of interesting small relievos in hard stucco, which had once decorated the walls of a large Buddhist temple dating probably from the fifth or sixth century A.D. Finds made here of decorated pottery were important as supplying evidence about the date of the remarkable terra-cotta grotesques which I had collected in plenty from Yotkan, the site of the ancient Khotan capital.

From the Hanguya Tati I passed on to a group of small ruined sites in the belt of sandy jungle between the still cultivated areas of the Domoko oasis and the open desert of drift sand. The site of Khadalik, from which one of my treasure-seeking guides had extracted some MS. remains of interest, seemed disappointing at first sight; for its principal ruin, which soon proved to be that of a large Buddhist temple, presented itself merely as an extensive low débris heap covered with sand. But scarcely had we begun systematic clearing of it when pieces of paper MSS. began to crop out in numbers. It soon became evident that the destructive operations of those who in early days had quarried the ruined temple for timber, had failed to disturb the votive offerings of the last worshippers. So we were able to recover here in spite of the almost complete disappearance of the superstructure a large number of MS. leaves in Sanskrit, Chinese and the "unknown" language of Khotan, besides many inscribed wooden tablets. Plentiful remains of stucco relievos and fresco pieces once adorning the temple walls, together with painted panels, had also found a safe refuge in the sand covering the floor. Their style pointed clearly to the latter half of the eighth century A.D. We worked hard here with a large number of diggers, and practically without interruption from daybreak until nightfall. Yet it took us fully ten days to clear these temples, together with some smaller adjoining shrines and dwellings.

I cannot stop to describe the interesting instances of successful fight with the desert which I noticed in certain recently opened colonies on my way to Keriya, the chief oasis of an administrative district which is mainly desert. It is a fit region for producing "ships of the desert," and the seven big camels which I purchased at Keriya after a great deal of sifting and testing, proved the mainstay of my transport thereafter. On archæological expeditions into the desert such as I had to conduct, the cares and difficulties about "transport and supplies" are apt to become truly forbidding. But my own brave camels from Keriya never caused me worry. They held out splendidly against all privations and hardships, and were after nearly two years' travel so fit and fine-looking that when I had at last to dispose of them before my departure for India they realised over 50 per cent. profit, of course for the Government of India.

At Niya, the last small oasis eastwards, I had to prepare rapidly for fresh explorations at the ancient site in the desert northwards, where in 1901 I had made important discoveries among ruins already deserted in the third century A.D. It was pleasing to see how readily my old Niya diggers rejoined me. With the example set by this my "old guard," a column of fifty men with supplies for four weeks and additional camels for the transport of water could be raised within a single day's halt. Three rapid marches through the luxuriant jungle belt which lines the dying course of the Niya river northward took us to the supposed resting-place of that great holy warrior and martyr Iman Jafar Sadik, with its quaint collection of rags, yak tails, and other votive offerings. There we left behind the last abode of the living and also the present end of the river. Two days later I had the satisfaction of camping once more amidst the bare dunes close to the centre of that extended sand-buried settlement.

A route slightly diverging from that followed on my first approach to the site had taken me past a series of ruined dwellings, rows of gaunt trunks of dead fruit-trees and other signs of ancient occupation which had not been seen by me on my previous visit. The encouraging promise thus held out to us soon proved true when, after tramping about next morning, I started our fresh diggings at the northernmost of the ruined dwellings which lay scattered in a line some two miles to the west of the area explored in 1901, and then hidden by high dunes. The ruin we first cleared was a relatively small dwelling, covered only by 3 to 4 feet of sand. As soon as the floor was reached in the western end room, Kharoshthi documents on wood began to crop out. Soon I had the satisfaction of seeing specimen after specimen of these ancient records and correspondence in Indian language and scrip emerge from where the last dweller, probably a petty official, about 1700 years ago had left behind his "waste paper." My thoughts triumphantly travelled to Cambridge, where I knew my friend, Professor Rapson, was still busily engaged in the decipherment of the Kharoshthi records brought back from my first journey. Rectangular tablets of the official type, with closely-fitting wooden covers serving as envelopes: oblong boards and labels of wood serving for records and accounts of all kinds, were all represented among the finds. A number of the letter tablets still retained, in fact, their original string fastenings, and a few even their clay day seals. How cheered I was to discover among them impressions from classical intaglios showing Eros and Heracles.

At a far larger structure, which I next cleared, wind-erosion proved to have completely destroyed the walls and any objects once left between them, though the massive posts, bleached and splintered, still rose high. But on examining the ground beneath what seemed to have been an outhouse, I realised quickly that it was made up of layers of a huge refuse heap. Of course we dug into this unsavoury quarry, though the pungent smells which its contents emitted, even after seventeen centuries of burial, were doubly trying in the fresh eastern breeze driving fine dust, dead microbes, and all into one's eyes, throat, and nose. Our perseverance was rewarded at last by striking on a level fully seven feet below

the surface curious sweepings of all sorts, rags of manifold fabrics in silk, cotton, felt, seals of bronze and bone, embroidered leather, wooden pens, fragments of lacquer ware, etc., and in the midst of this dustbin, a dozen small Chinese tablets of exquisite penmanship. They seemed to be forwarding notes of consignments, and the localities mentioned in them throw interesting light on the connection maintained with distant parts on the route into China proper.

I cannot attempt to give details of the busy days spent in searching the chain of dwellings stretching southwards. Kharoshthi records on wood, whether letters, accounts, drafts or memos, turned up in almost every one of these dwellings, besides household objects and implements illustrative of everyday life and the prevailing industries. Curious discoveries almost daily seemed to efface all sense of time. When, after laboriously clearing a perfectly preserved living-room, filled with nine feet of sand, I found that its last dweller had carefully removed all its furniture and fittings, I could not help giving vent to my feelings at such mean stinginess, until I discovered that quite a sheaf of accounts and memos was waiting for me on the top of the high fireplace, where their pedantic owner had evidently forgotten to look for them. Though nothing of intrinsic value had been left behind by the last dwellers of this modest Pompeii, there was sufficient evidence of the ease in which they had lived in fine wood carvings of Græco-Buddhist style, in the large number of individual rooms provided with fireplaces, comfortable sitting platforms, etc. Remains of fenced gardens and of avenues of poplars or fruit-trees could be traced almost invariably near these houses. Curiously enough such frail structures as rush fences seemed to have suffered least from that chief factor of destruction—wind erosion.

I must forgo any attempt at detailed description of our fortnight of exacting but fruitful work. Yet a particularly rich haul of ancient documents may claim mention. I was clearing a large residence in a group of ruins on the extreme west of the site. Fine pieces of architectural wood carving brought to light near a large central hall soon proved that the dwelling must have been that of a well-to-do person, and finds of Kharoshthi records of respectable size, up to three feet long, suggested his having been an official of some consequence. The hope of finding more in his office was soon justified when the first strokes of the "Ketman" laid bare regular files of documents near the floor of a narrow room adjoining the central hall. Their number soon rose to over a hundred. Most of them were "wedges" as used for the conveyance of executive orders; others, on oblong tablets, were accounts, lists and miscellaneous "office papers," to use an anachronism. The scraping of the mud flooring for detached pieces was still proceeding when a strange discovery rewarded honest Rustam, the most experienced digger of my "old guard." Rustam had just extracted between the wall and a lump of clay, left there apparently by accident, a well-preserved double wedge tablet, when I saw him eagerly burrowing with his hands into the floor just like my little terrier when he is at work opening rat holes. Before I could put any questions I saw Rustam triumphantly draw forth from about 6 inches below the floor a complete rectangular document

with its double clay seal intact and its envelope still unopened. When the hole was enlarged we saw that the space towards the wall and below the foundation beam of the latter was full of closely packed layers of similar documents.

It was clear that we had struck a small hidden archive, and my joy at this novel experience was great. The fact that with a few exceptions all the rectangular documents, of which over three dozen were obtained in the end, had their elaborate string fastenings unopened and sealed down on the envelope, manifestly confirmed the idea that these were agreements or bonds which had to be kept under their original fastenings and seals in order that in case of need their validity might be safely established. The care which had been taken to hide the deposit and at the same time to mark its position showed that the owner had been obliged to leave the place in an emergency but with a hope of returning. On cleaning the clay sealings at night in my tent I discovered that almost all had remained as fresh as when first impressed, and that most of them were from seals of classical workmanship representing Heracles with club and lion skin; Eros; Pallas Promachos; helmeted busts, etc.

As our work proceeded to the south of the site the ruins had to be searched for amidst closely set sand cones raising their sombre heads under tangled masses of tamarisk, dead or living, to 40–50 feet. We emerged at last upon somewhat more open ground towards the southern end of the site. The ruined dwellings were small there; but an inspection of the ground near by revealed features of interest. Only some sixty yards from the ruin which had yielded the first tablets, there stood a square of dead mulberry-trees raising their trunks up to 10 feet or more which had once cast their shade over a tank still marked by a depression. The stream from which the canal once feeding it must have taken off, was not far to seek; for behind the nearest ridge of sand to the west there still lay a foot-bridge about 90 feet long stretched across an unmistakable dry river-bed (Fig. 3). Of the trestles which had carried the bridge, two still stood upright half buried in sand. Beyond the left bank stretched shrivelled remains of arbours. For over two miles to the north-west we could follow the traces of the ancient river-bed in places completely covered by drift sand, but emerging again amongst low dunes and patches of dead forest. Over all this strange ground desiccation was written most plainly.

The four hundred odd miles of desert through which my marches took me in November from the Niya site past Charchan to Charklik, offered opportunities for interesting archæological work at more than one point. But I cannot pause to describe it.

At the small oasis of Charklik, the *Lou-lan* of the old Chinese pilgrims and Marco Polo's *Lop*, the preparations for my long-planned expedition to the ruins north of Lop-nor, first discovered by Dr. Hedin on his memorable journey of 1900, proved an exacting task. Within three days I had to raise a contingent of fifty labourers for the proposed excavations: find food supplies to last all of us for five weeks, and to collect as many camels as I possibly could get for the transport, seeing that we should have to carry water, or rather ice, sufficient to supply us all on a

seven days' march across waterless desert, then during a prolonged stay at the ruins as well as on the return journey. The problem looked, indeed, formidable when I found that, exhausting all local resources, I could raise the number of camels only to twenty-one.

On December 11th, crossing the deep and still unfrozen Tarim, I started my desert column from the small fishing hamlet of Abdal. For one day we followed the incipient Lop-nor marshes eastwards, and luckily found good ice already available in one of the freshwater lagoons. Every available camel was loaded with big bags full of ice. The route we now struck to the NNE. led necessarily near the one followed by Hedin in 1900 in the reverse direction. But there was

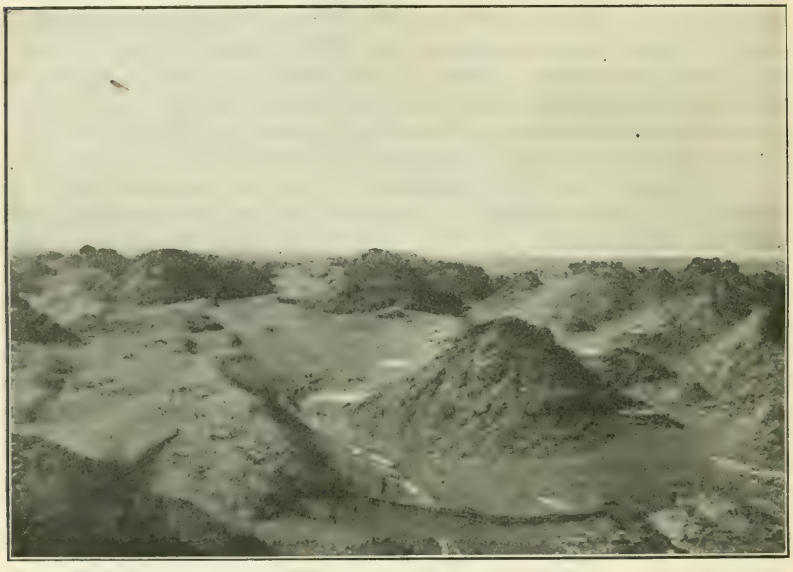


Fig. 3.—Ancient foot-bridge across dry river-bed in desert beyond Niya river end.

nothing to guide us, only the position of the ruins as indicated in his route map, and the compass.

On the morning of the 15th of December we had left behind us the last salt-encrusted depression with dead poplars and tamarisk, and very soon after we passed into that zone of excessive erosion which constitutes so striking a feature of the northern portion of the Lop-nor desert. The succession of steep clay banks and sharply cut nullahs between them, all carved out by wind erosion and clearly marking the prevailing direction of the winds, NE. to SW., was most trying to the camels' feet. There could be no doubt about this ground forming part of a very ancient lake-bed. Yet, curiously enough, we had scarcely entered it when frequent finds of flint arrow-heads and other implements of the Stone Age, supplied evidence that it must have been occupied by man in prehistoric times. By that time we were already in the

clutches of an icy NE. wind which in the middle of the following night nearly blew my tent down. With short intervals it continued during our whole stay in this region. With minimum temperatures rapidly falling below zero Fahr., it made life exceedingly trying for the next weeks.

So it was a great relief for us all when on December 17th the first great mound indicating proximity of the site was duly sighted. By nightfall I was able to pitch camp at the foot of the ruined Stupa which stands out in this weirdly desolate landscape as the landmark of the main group of ruins. The excavations which I carried on unremittently for the next eleven days with a relatively large number of men, enabled me to clear all remains traceable at the several groups of ruins and yielded plentiful results. Among the dwellings constructed of timber and plaster walls exactly like those of the Niya site, wind erosion had worked terrible havoc. But luckily, in various places a sufficient cover of drift sand or consolidated refuse had afforded protection for many interesting relics. In a large rubbish heap, fully 100 ft. across, extending near the centre of what proved to have been a small fortified station, we struck a particularly rich mine. The finds of written records, on wood and paper, also on silk, proved remarkably numerous.

The majority of the records are in Chinese, apparently chiefly of an administrative character. But documents in Kharoshthi script and in Prakrit language were also numerous. Considering how far removed Lop-nor is from Khotan, this uniform extension of an Indian script and language to the extreme east of the Tarim basin has a special historical interest. Architectural wood carvings, objects of industrial art, metal seals, etc., brought to light in considerable number show the same close dependence on models of Græco-Buddhist art brought from India. Even without the evidence of dated Chinese documents and of the very numerous coin finds, the art remains would have sufficed to prove that the ruins were abandoned about the same time as the Niya site, *i.e.* the latter half of the third century A.D. There were a series of indications to show that the settlement derived its importance far more from the traffic with China which passed through it than from the resources of local cultivation. Yet even allowing for this, how impressive is the evidence of the great physical changes which have overtaken this region, mainly through desiccation. For over 150 miles to the east no drinkable water could be found now along the line which the route must have followed.

Our ice store was getting very low. Cases of illness among the men showed how exposure to the continuous icy blasts was telling on them. So it was just as well that by December 29th the exploration of all structural remains traceable was completed. The main camp in charge of the surveyor was sent back to Abdal, while I set out with a few men through the unexplored desert south-westwards. It was an interesting though somewhat trying tramp which after seven days brought us safely to the ice of the Tarim lagoons. Progress was far more difficult than on the journey from Lop-nor owing to the steadily increasing height of the ridges of drift sand we encountered. The rows of dead trees marking the banks of ancient lagoons or river-courses soon disappeared here. The

resulting difficulty about fuel was a serious matter for us, considering that just then we experienced the lowest temperatures of the winter, down to 48 degrees below freezing-point. Relics of the Stone Age, including a fine jade axe, cropped up here too on the rare patches of eroded bare ground.

I hurried *via* Charklik to resume excavations at Miran. This too was a very desolate spot, situated at the foot of the absolutely barren gravel glacis which stretches down from the mountains towards the westernmost portion of the Lop-nor marshes. A small stream still passing within a few miles of the ruins spared us the usual anxieties about water transport. But none of our party is ever likely to forget the misery we endured during those three weeks of hard work from the icy gales almost always blowing. There were days when all my assistants were on the sick list with the exception of bright, alert Chiang-ssŭ-yieh. But the results achieved offered ample reward to me. The ruined fort quite fulfilled the promise held out by the first experimental digging. The rooms and half-underground hovels which had sheltered its Tibetan garrison during the eighth to the ninth century A.D., were rough enough in design and construction, but proved to contain in some respects the most remarkable refuse accumulations it has ever fallen to my lot to clear. Rubbish filled them in places to a height of 9 to 10 ft., and right down to the bottom the layers of refuse of all sorts left behind by the occupants yielded in profusion records on paper and wood, mostly in Tibetan, but some in the earliest Turki writing. The total number rose in the end to close on a thousand. Similarly the remains of implements, articles of clothing, arms, etc., were abundant. But I must add also, for intensity of absolute dirt and age-persisting "smelliness" I shall always put the rich "castings" of Tibetan warriors in the front rank.

There can be no doubt that the stronghold was intended to guard the direct route from the southern oases of the Tarim Basin to Tun-huang (or Sha-chou). But older in date and of far wider interest were the art remains which we brought to light from the débris mounds of some Buddhist shrines (Fig. 4) surviving erosion in the vicinity of the fort. These must have been in ruins at least four centuries before the Tibetan occupation led to the erection of the fort. From one of them emerged remnants of colossal stucco relievos representing seated Buddhas. The influence of classical art was reflected with surprising directness in the much damaged yet remarkable frescoes which covered what remains of the walls of two circular domed temples enclosing small Stupas. Some of the frescoes were so thoroughly Western in conception and treatment that when they first emerged from the débris I felt tempted to believe myself rather among the ruins of some Roman villa in Syria or Asia Minor than those of Buddhist sanctuaries on the very confines of China. Kharoshthi inscriptions painted by the side of some frescoes indicate the third century A.D. as the approximate date when these temples were deserted.

From Abdal a large caravan entrusted to two veteran Turki servants was to take my finds back to Mr. Macartney's care at Kashgar. Then on February 21, 1907, I started on the long desert journey from the

dreary Lop-nor marshes right through to Tun-huang on the westernmost border of Kansu and China proper. It was the same route by which Marco Polo had travelled "through the desert of Lob." Six centuries before him it had seen a traveller scarcely less great, Hsüan-tsang, the pilgrim of pious memory, returning to China laden with Buddhist relics and sacred books after many years' wanderings in the "Western Regions." Ever since the end of the second century B.C., when the Chinese first brought the Tarim Basin under their political influence, this desolate desert track, close on 350 miles in length, had served as an important caravan route during successive periods, only to be forgotten again when Chinese power westwards weakened or a policy of rigid

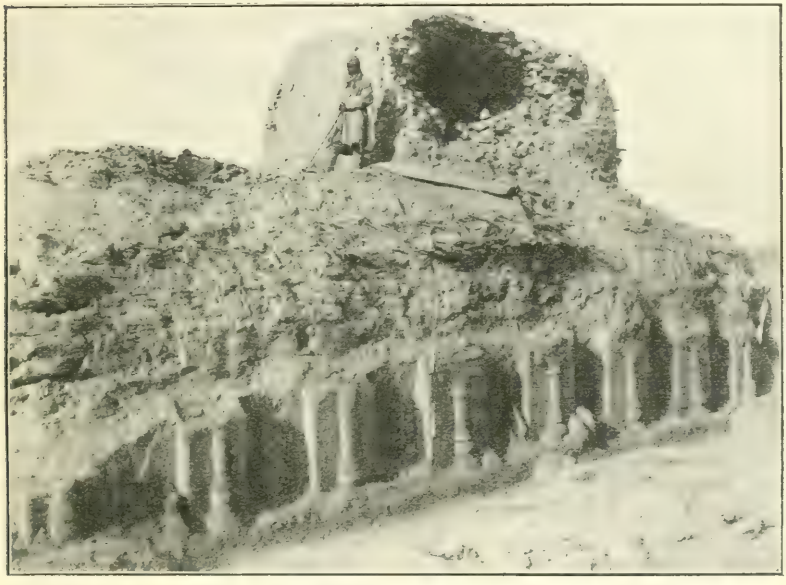


FIG. 4.—Base of ruined Buddhist shrine, Miran.

seclusion strangled trade. Some twenty-five years ago it had thus to be re-discovered.

The seventeen long marches in which we accomplished the desert journey, still ordinarily reckoned, as in the days of Marco, at twenty-eight stages, offered plentiful opportunities for interesting geographical observations. But to these I cannot refer here.

At a point still five long marches from the edge of the Tun-huang oasis, I first sighted remains of ruined watch-towers and soon came upon traces of an ancient wall connecting them. A lucky chance rewarded already the first scraping of the ground near a watch-tower with relics of manifest antiquity, and a variety of archæological indications rapidly gathered as we passed onwards made me feel convinced that these ruins belonged to an early system of frontier defence corresponding in char-

acter to the extant "Great Wall" on the Kansu border. So after the shortest possible halt at Tun-huang, I returned to the still wintry desert in order to explore this ruined *limes* in detail. It proved a fascinating and fruitful task, but also one of uncommon difficulty.

No information whatever could be obtained at Tun-huang about the ruins, though the educated Chinese officials there all took a very friendly interest in my work, and would have been ready enough to help us. So all the tracking of the ancient wall, often completely effaced for miles and frequently crossing most deceptive ground, had to be done by myself. Still more serious was the trouble about adequate labour for excavations. Yet by moving first to the north of the oasis, and subsequently striking the ancient *limes* by a new route right through the desert west of Tun-huang, we succeeded in the course of two months in accurately surveying its line all the way from An-shi to its westernmost point, a distance of some 140 miles, and in exploring the ruins of all watch-stations, sectional headquarters, etc.

The fine massive watch-towers, usually rising at intervals of two to three miles along the wall, were my best guides in tracking the line. Almost invariably I could trace near them ruins of the modest quarters which had sheltered the detachments écheloned along the wall. From the Chinese records, mostly on wood or bamboo, which the excavation of almost every ruin yielded in plenty, I soon made certain that this frontier line dated back to the end of the second century B.C., when Chinese expansion into Central Asia first began under the emperor Wu-ti. Exactly-dated documents commencing with the year 99 B.C. showed that the regular garrisoning of the border wall continued throughout the first century B.C., and probably for the greatest part of its length down to the middle of the second century A.D. The main purpose of this *limes* was undoubtedly to safeguard the territory south of the Su-lo-ho river, which was indispensable as a base and passage for the Chinese military forces, political missions, etc., sent to the Tarim basin. It is equally certain that the enemy whose irruptions from the north had to be warded off were the Hsiong-nu, the ancestors of those very Huns who some centuries later threatened Rome and Byzantium.

The very character of the ground through which the fortified frontier line ran from Anshi westwards, almost all of it already in ancient times a real desert, had presented exceptionally favourable conditions for the preservation of antiques. So it was natural enough that the hundreds of inscribed pieces of wood, bamboo, silk, the remains of clothing, furniture and equipment, which the successive occupants of these desolate posts had left behind as of no value, should have survived practically uninjured. Sometimes a mere scraping on the surface sufficed to disclose rubbish heaps in which files of wooden records thrown out from the office of some military commander before the time of Christ lay amongst the most perishable material, straw, bits of clothing, etc., all looking perfectly fresh. The Chinese documents, of which I recovered in the end over two thousand, refer mainly to matters of military administration, often giving exact details as to the strength, movements, etc., of the troops écheloned along the border; their commissariat,

equipment and the like. More curious still are private letters addressed to officers full of quaint actualities, family news from their distant homes, etc. The careful study of these miscellaneous records, together with that of the actual remains of quarters, furniture, arms, etc., will suffice to restore an accurate picture of the life led along this most desolate of borders. But in addition to this evidence I recovered very interesting relics of the traffic from the distant west in the form of silk pieces inscribed with Indian Kharoshthi and Brahmi, and in a number of letters on paper found carefully fastened, containing writing in an unknown script resembling Aramaic.

The construction of a regular defensive line across so extensive a stretch of desert bare of all resources must have been a difficult task, and it was interesting to find again and again evidence of the skill with which the old Chinese engineers had attacked it. Guided by a sharp eye for all topographical features, they had cleverly used the succession of salt marshes and lakes to supplement their line by these natural defences. For the wall itself they had had recourse to materials which, though of little apparent strength, were particularly adapted to local conditions. Between layers of stamped gravel about one foot high each they interposed carefully secured rows of fascines about as high, made of neatly cut and strongly tied bundles of reeds which were obtained from the marshes. The salts contained everywhere in the soil and water soon gave to the strange rampart thus constructed a quasi-petrified consistency which in such a region could well hold its own against man and nature —all forces in fact but that of slow grinding but almost incessant wind erosion.

Again and again I noted in the course of my surveys how well preserved the wall rose along those sections which lay parallel to the prevailing direction of the winds, while, where the line lay across it and in any way barred the progress of driving sand, wind erosion had badly breached or completely effaced the rampart. The winds which now blow over this desert with remarkable violence and persistence, come mainly from the east and north-east.

The wall shows everywhere a uniform thickness of eight feet, and still rises in places to over twelve feet. But that its builders knew how to make greater efforts where needed, in spite of all difficulties about labour, materials, etc., is proved by watch-towers rising in one solid square mass to heights of thirty feet or more. One small fort, marking probably the position of the gate station of *Yü-mén*, long vainly sought for by Chinese antiquaries, showed high and solid walls of stamped clay fully fifteen feet thick. Still more imposing is a solid block of halls nearly 500 feet long, which at first puzzled me greatly by its palace-like look and dimensions, until finds of dated records of the first century B.C. near by proved that it had been constructed as a great magazine for the troops garrisoning the line or passing along it.

I might talk for hours about the strange observations and experiences which, in the course of those fascinating months, made me forget as it were the lapse of long ages. One touch must suffice here. More than once as I sat in the evening amidst the debris of some commanding watch-station the slanting rays of the sun showed up quite clearly a

curiously straight, furrow-like line keeping parallel to the wall and about twenty feet within it wherever there was a well-preserved stretch of it. Repeated examination proved that it was a shallow but well-defined track worn into the fine gravel soil by the patrols and others who had tramped along here for centuries.

We suffered a great deal from the almost daily gales and the extremes of the desert climate. On April 1st I still registered a minimum temperature of 39 degrees below freezing-point. But before the month was ended the heat and glare had already become very trying, and whenever the wind fell perfect clouds of mosquitoes and other insects would issue from the salt marshes, near which we had to camp for the sake of the water, to torment men and beasts. Another source of trouble was the saltness of the water. When the excavations had been completed by the middle of May it was high time to return to the oasis.

(To be continued.)

THE VEGETATION OF THE BALKAN STATES.[1]

The countries adjoining the Balkans have played a conspicuous part in the history of Europe, but their physical features and natural history are not so well known. The plant-geographer must now admit that his knowledge of south-eastern Europe has been greatly enlarged by the enterprise of the editors of *Die Vegetation der Erde*, who have been fortunate in securing important memoirs from eminent botanists in that region. A monograph on the vegetation of the Carpathians by Dr. Pax was completed recently (see *Scottish Geographical Magazine*, vol. xxv. p. 443), and in 1901 there was issued Ritter von Beck's work on the vegetation of the Illyrian countries, including South Croatia, Dalmatia, Bosnia, Herzegovina, Montenegro, Northern Albania, and Servia (see *Scottish Geographical Magazine*, vol. xviii. p. 273). The volume now under consideration deals with the area lying between von Beck's "Illyria" to the west, and Pax's "Carpathians" to the north: it includes Servia, Bulgaria, Eastern Roumelia, and the northern parts of Thrace, Macedonia, and Eastern Albania, that is, approximately, the former Roman province of Moesia.

The author, Professor Lujo Adamović, lecturer on Plant-Geography in the University of Vienna, has worked the area systematically since 1890, and he is the author of nearly fifty papers on its botany. In the historical review one sees that many botanists have explored these lands, but most of all Josef Pančić. This botanist practically discovered the vegetation of these Balkan countries, and was considerably assisted by King Milan, himself a good botanist, who showed his interest by establishing the present botanic garden at Belgrade. It is noteworthy that the present volume is dedicated to Ferdinand I. of Bulgaria, "through

[1] *Die Vegetationsverhältnisse der Balkanländer.* By Dr. Lujo Adamović. (*Die Vegetation der Erde*, Part xi.). Leipzig: Engelmann, 1909. *Price* 40 *m.*

whose generosity the printing of so many costly maps was made possible." Complaints have been made in this *Magazine* of the meagre supply of maps in this series of phytogeographical monographs, and it is pleasant to record that in this volume there is an excellent series, coloured to show the vegetation. Two maps show the whole area (scale 1 : 750,000), and they will be found useful as physical and topographical maps of this complex region, where most ordinary atlases are quite inadequate. Four coloured maps on a larger scale show the distribution of vegetation on the Rila Planina, and other mountain groups. The memoir is also well illustrated with about seventy excellent reproductions from photographs, which show typical plant habitats.

The memoir (565 pp.) is divided into four sections:—Physical geography, the vegetation and its formations, the present distribution of the flora, and its development since past times. To enter into these in detail is outside our limits, and much of the matter is strictly botanical and of local interest. Some prominence may be given, however, to the author's conclusions on the conditions determining the distribution of the vegetation, especially as these have a general interest for phytogeography, and with regard to certain aspects of Scottish vegetation.

The Balkan-lands are much cut up by mountains which enclose greater or less expanses of plain, and these physical features bear directly on the present distribution of the vegetation. The Transylvanian Alps of the Carpathian system cross the Danube at the Iron Gates, and become part of the complex mountain system of Servia, which is intersected by the valleys of the Drina, the Morava, and numerous branches extending far south into the Dinaric Alps. From this mountain complex the Balkans and Rhodope Mountains ultimately emerge as parallel ranges to the east. The Balkans form the southern boundary of the great Danube plain, and gradually descend from 6600 feet on the Stara Planina between Servia and Bulgaria, to low hills near the Black Sea. The Rhodope Mountains include in the west the Rila Planina, the most imposing mountain group of the Balkan Peninsula, with Mt. Muss Alla rising to 10,000 feet; they form the boundary between Bulgaria and the countries to the south, and continue eastwards towards Adrianople, being still represented in a hilly country extending to the Black Sea. The larger river-valleys include a number of plains, the Danube series ending in the great Danube plain which extends from the Timok to the Black Sea. Between the Balkans and the Rhodope Mountains there is another large system of somewhat undulating plains, including those round Sofia and Philippopolis, and those along the Maritza and Tundza famous as the chief centre for "attar of roses." Other smaller but warm and fertile plains lie in the valleys of the Struma and other rivers which flow southwards from the Rhodope Mountains.

The climate of these Balkan-lands is referable to three distinct European types. The West Moesiac zone, covering most of Servia, is distinguished by northerly and easterly winds, January and February

being the coldest months, but frost occurs on more than one hundred days per annum: the spring is cool and moist, the summer is hot with an average of 65 days over 75° F., the autumn is long and warm during the day, but night-frosts occur in September. The East Moesiac zone coincides with the plain south of the Danube; east winds predominate and bring a climate like Southern Russia; the winter is shorter than in the western zone, but is intensely cold (January +5° F. to − 5° F.), and the Danube freezes about once in three years; the summer is dry and hot, temperatures of 104° F. being attained. The South Moesiac zone with a Mediterranean climate is most typically represented in Eastern Roumelia, but it penetrates into many of the valleys; summer conditions last from May to October, and the lower temperatures rarely reach freezing-point. The relation of these three types of climate is discussed with reference to tectonic factors on the one hand and to the vegetation on the other. The northern extension of the Mediterranean climate and flora is defined by the high Rhodope range, but "enclaves" of southern plants are met with up the valleys as far north as the slopes of Vitosa, just south of Sofia. This same warm climate extends up the valleys and spreads over the Roumelian plain, which is much warmer than the shores of the Black Sea, because it is protected from the easterly and northerly winds by an undulating country. Turning now to the north, one sees that the tectonic factors favour a southward extension of the climatic conditions of continental Europe. Sofia, for example, has almost the same annual temperature as Vienna which lies 6° north, and it is much colder than places on its own latitude in northern and central Italy and in western Europe. The influence of mountain ranges is very evident on the Danube plain: the plains of Hungary and Roumania are comparatively warm because they lie close under the shelter of the Carpathian system; on the other hand, the plains between the Danube and Balkans are too far south to benefit, but receive the full effect of the north winds from snowy summits. Thus the northern slopes of the Balkans present a distinct contrast to those on the south, where the Mediterranean conditions are evident. The great summer drought of the Danube plain is due to the prevailing east winds from Southern Russia, which exert their influence till stopped westwards by the mountains of Servia, and they penetrate up valleys such as the Isker to the district round Sofia. In Servia, the Save and the Danube flow from west to east, but along the tributaries, the Drina and Morava, north winds penetrate far southwards into the higher valleys amongst the Dinaric Alps. There are, however, sheltered "enclaves" where southern plants assert themselves.

Dr. Adamović is a strong supporter of the influence of tectonic factors on vegetation, and it has just been shown how they affect the climate in Moesia. In discussing the ecological or environmental conditions of the vegetation the same argument is maintained, as may be indicated by a few extracts. "In many ecological publications, the greatest influence is ascribed to climatic conditions." "Others strive to trace everything to the influence of the soil." "Without denying that great influence must be ascribed to these two factors, we must still maintain

that neither climate alone, nor soil alone, nor both together, entirely determines the composition and the character of the vegetation." The author is thus of opinion that the influence of tectonic factors is neglected. One might discuss this imputation if any ground existed for it, but no one who has read the ecological writings of Schimper, Warming, Schröter, or Flahault, can lay them down without feeling that oceans, mountains, rivers and plains all play their part in influencing climate, soil and vegetation. There is, however, enough in Dr. Adamović's treatment of this subject to convey a lesson in considering the vegetation of say the mountainous parts of Britain. The influence of mountains as barriers to climate has its effect on the vegetation, and, as already pointed out, the winds prevailing in a valley must bring distinct conditions, which ought always to be considered. Mountains and valleys are thus routes of migration for plants, because somewhere, high or low on the slopes, any given species can find those conditions best suited for its full development and reproduction. Thus to many plants the Danube plain would be a complete barrier, but the fact that the Carpathians come down to and cross the Danube opens a way for exchange between north and south. A long simple mountain range without lateral spurs or broad intersecting valleys is well adapted to act as a bridge for migration, but the number of species will probably be small because the slopes are everywhere exposed. The conditions on a mountain "massif" are different, spurs branch off in many directions, thus affording much variety in exposure and shelter, and favouring a greater number of species. The mass is also less liable to extreme climatic conditions, and in Servia the presence of grouped mountains furnishes the lower lands with moisture, an important item in a region with summer drought: a longer winter also results, but this furnishes conditions suitable for the growth of species requiring moisture and a cool climate. The author also confirms an important conclusion in phytogeography, namely that in a great "massif" all the zonal limits of plants are lifted upwards. This means, using local examples, that a tree-limit of 2000 feet may be expected in the heart of the Grampians where altitudes of 3000 feet are common, but on long simple ranges like the Sidlaws and Pentlands where the higher altitudes are about 2000 feet, the possible tree-limit is not more than about 1500 feet. In the same way, the cultivation of crops is actually carried higher in the Perthshire "massif" than it is on the long open ranges. Dr. Adamović attributes this to wind more than to temperature or soil. The higher and more complex the mountain group, then so much higher lies the most destructive sphere of the wind: hence there is for plants a greater area available with a favourable environment, including suitable insolation, soil-warmth and soil-moisture. The "massif" also tells in another way. On a narrow range with peaked summits, narrow ridges and steep broken slopes, the atmospheric agents which effect weathering and erosion have full play, hence screes of talus and wind-swept rocky slopes occupy a large proportion of the ground and are unsuitable for a large plant population. On the "massif" all this is modified, and a greater part of the area consists of rounded summits with broad intervening cols and gentle slopes completely clad

with grassland, moor or forest. Here erosion has less effect, the soil is less disturbed, and the primitive vegetation remains, whereas on recently disturbed soil only a few relict species can retain their place and a number of new-comers find a home.

A considerable part of the memoir deals in detail with the formations constituting the vegetation, but a passing glance at a few of the more noteworthy must suffice. The most important forest of the Mediterranean part of the area is that of the Flowering or Manna Ash (*Fraxinus Ornus*). This tree forms the chief element in a somewhat mixed forest in which the Silver Lime (*Tilia alba*) is also conspicuous. It is a characteristic forest for the hilly parts of the Balkan Peninsula, and the author claims it as a distinct forest type from the variety and number of species represented. Amongst the woodlands of Britain there is a type distinguished by prevalence of the Ash (*Fraxinus excelsior*) with a characteristic undergrowth, comparable in some ways with the Manna Ash woodlands of the Balkans. In both cases the dominant trees form an open canopy through which much light passes, and this accounts for the rich ground-vegetation ; both formations are also partial to calcareous soils though occurring also on others. The Manna Ash formation is regarded by Dr. Adamović as derived from an original Oak forest, which is still found in patches where the Pubescent Oak is dominant with our British Oak as a rarer species. The usual scarcity of Oak is put down to disforesting by man, the valuable Oak being taken and the less valued Manna Ash, Lime, Horse Chestnut, etc., being left. After disforesting, the Oak is slow in natural regeneration, whereas its rivals grow up quickly in great numbers. Erosion, again, during the time after disforesting, wastes the deep soils which the Oaks prefer, but this does not affect its shallow-rooting competitors. In the cooler northern parts of the Balkan-lands, Oak forest is widely distributed about the valleys and lower slopes of the hills, but here the characteristic Mediterranean associates of the ground-vegetation are lacking. In every way it is nearer the familiar British Oak forest, although the dominance of the British Oak is disputed by the Hungarian Oak (*Quercus conferta*). Amongst common trees and shrubs may be noted Aspen, Birch, Ash, Wild Cherry, Apple and Hazel, all familiar enough in our own woodlands. The forests of the higher mountains include Silver Fir, Scots Pine, and Beech, but especial interest is attached to the Omorica Fir (*Picea Omorica*) discovered last century and now one of the finest of introduced Conifers in Britain ; it is indigenous in the valleys of the Dinaric Alps.

Many plant formations of lower stature are also described in detail, but reference must be made to the original. An important type may be mentioned, the "Sibljack," which has a wide distribution through the whole Balkan Peninsula. It is a copse or bush rather suggesting the "Maquis" so familiar to travellers along the Mediterranean coasts, but the author regards it as distinct. The most familiar of the dominant shrubs of the "sibljack" is the Lilac, and one can imagine the beauty of square miles of this in flower. It is also instructive that the vegetation of the Balkan-lands, which begins in a Mediterranean climate, ascends

zone after zone till it finishes exactly where our Clova Mountains do, in alpine crags scattered about in a mass of Blaeberry and other species of Vaccinium on a peat soil, along with the familiar Scottish associates of this formation.

The agricultural products of the Balkan-lands are very varied, ranging from oats and wheat to maize, tobacco and other crops of the Mediterranean region. But the British farmer would be aghast at the usual practice of the Balkan peasantry "until thirty years ago under Turkish government": this consists in sowing wheat, barley, rye and maize all altogether in one field, and as no trouble is taken to obtain pure seed-grain, the mixed produce is sown year after year, till weeds accumulate to as much as ten per cent. of the whole crop. The most noteworthy cultivated plant in the plain round Adrianopolis is the Rose, grown in fields for the petals which are collected in May and June and distilled to extract the oil "attar of roses." This industry is extensive; in 1907 5000 lbs. of the oil were placed on the market; in 1904 over 8000 lbs. Each lb. of "attar" is the product of about 3500 lbs. (31 cwts.) of rose petals, and as each grower generally distils his own produce, we are told that at least 13,000 stills are in use.

These few items of general interest must suffice to indicate the scope of this memoir, which deals so thoroughly with the vegetation of a land of much historic interest. The author and the editors are to be congratulated on the work, which takes a worthy place in a series compiled by some of the best botanists of recent times. W. G. S.

THE SCOTTISH LAKE SURVEY: A REVIEW.[1]

(With Illustrations.)

THE Report on the Scientific Results of the Bathymetrical Survey of Scottish Fresh-Water Lochs has now been published in six handsome volumes, and since the publication of Forel's *Le Léman* in 1894, no work of such importance to Limnology has been published. The history of the Survey is familiar to members of the Scottish Geographical Society, as reports of the work of the Survey have from time to time appeared in the *Magazine*, and details need not be given here.

So long ago as 1883 the importance of such a survey was urged by Sir John Murray, and strenuous but ineffectual efforts were made to persuade the Government to undertake the work. Soundings in a few lochs had been made from time to time by various geographers, but no work of a systematic nature was carried out until 1897, when Sir John Murray and Mr. Fred. P. Pullar began an organised survey. This joint

[1] *Bathymetrical Survey of the Scottish Fresh-Water Lochs*: conducted under the direction of Sir John Murray, K.C.B., F.R.S., D.Sc., etc., and Laurence Pullar, F.R.S.E., F.R.G.S., during the years 1897 to 1909. Report on the Scientific Results. *Challenger* Office, Edinburgh, 1909. Six volumes. £5, 5s. (Vol. I. published separately at £1, 1s.) Half-bound in finest pigskin.

work was brought to a tragic end by the death of Mr. Fred. Pullar, who lost his life on 15th February 1901, while gallantly attempting to rescue a number of people who, through an ice accident, had been immersed in Airthrey Loch, within a mile of his own home.

There was a likelihood of the whole work being brought to a standstill, but Mr. Laurence Pullar, the father of Mr. Fred. Pullar, expressed a desire that the work in which his son was so interested should be carried to a satisfactory conclusion, and placed a sum of £10,000 in trust for carrying on the survey.

Sir John Murray threw his energies into the work with great thoroughness, and the sum-total of the work which has been done is a large one. In all, 562 lochs have been surveyed, and over 60,000 soundings have been taken. Nearly fifty persons have taken part in the work for longer or shorter periods in addition to numerous temporary assistants; and while the survey was in active progress, the Survey headquarters were the resort of eminent limnologists from Denmark, Switzerland, and Germany, who came to aid the surveyors with their experience and to see their methods of work.

No such extensive survey having been previously carried out, it was natural that many initial instrumental difficulties should have to be overcome. Many new instruments were designed by the surveyors, and new methods and lines of work were carried out.

The principal work of the survey was, of course, the taking of soundings, and this was done on all lochs on which boats were available. The descriptions of these lochs and measurements of their area, volume, etc., occupy Vol. II. of the Reports, and this will form a most useful volume of reference to engineers and others who interest themselves in the development of water power. Maps of all the lochs surveyed showing the soundings taken, dissected and mounted on cloth, are contained in Volumes III., IV., V., and VI., and they are so indexed and tabulated that reference is easy. Convenient tables are also given showing the lochs arranged according to (1) length, (2) maximum area, (3) depth, (4) mean depth, (5) volume, (6) river basins. The lochs surveyed range from Loch Ness, which has a volume of 263,162 million cubic feet, to Loch Allt na Mult, with a volume of only a hundred thousand cubic feet. The descriptions of the lochs and the maps have already been published by the Royal Geographical Society. The directors of the Survey acknowledge their indebtedness to Dr. J. G. Bartholomew for the care bestowed in the production of these maps.

But the work of the Survey was not confined to the taking of soundings. Biological and physical observations were simultaneously carried out, and results of great interest were obtained, and these have been published in the Transactions and Proceedings of various learned societies. Volume I. of the present reports contains a number of articles written by specialists in the various branches of limnology, summarising the work done and the present state of our knowledge of the science. This volume is published separately from the remaining volumes, and should form good reading for those interested.

Sir John Murray contributes a paper on "The Characteristics of

Otterston Loch, Fife, a typical lowland loch with luxuriant vegetation. [*Photo by Mr. Geo. West.*

Lakes in General, and their Distribution over the Surface of the Globe," in which he summarises the state of our knowledge of the lakes of the world, and in his wide survey he describes what is known of the physical and biological conditions of about 250 lakes. An immense quantity of material has been used for the writing of this article, and the information which is brought within its compass cannot fail to be of great service to all limnologists. Perhaps the chief interest of the article lies in the classification of lakes which Sir John Murray has attempted. Hitherto all classifications have been chiefly distinguished by their artificiality. The arrangement of lakes according to their size, their temperature, and the character of their basins, is of value for limited areas and for special objects, but. hitherto no classification has been made which enables a broad view to be taken of the geographical distribution of lakes. Sir John has classified the lakes with which he deals into (*A*) those in the region of Inland Drainage Areas, where evaporation exceeds precipitation, situated in the desert portions of the globe; and (*B*) those in the region of drainage areas the waters from which flow directly into the ocean, where precipitation exceeds evaporation, situated in the well-watered regions of the globe with abundant vegetation.

This classification possesses a reality because it depends on the meteorological conditions of the respective areas, which have a very marked influence on vegetable, animal and human life as well as on the geological strata in process of formation.

In the first region, which covers 20 per cent. of the land surfaces and 5½ per cent. of the whole surface of the globe, the rainfall is usually less than 10 inches per annum. The sand, gravel and fine dust derived from the disintegration of rocks are distributed by winds and water in a manner not observed in other regions. Vegetable and animal remains are never abundant. The lake deposits, so far as examined, present peculiarities which can be detected, and they are largely composed of sandy particles, even when mixed up with salt deposits. There is very little or no organic deposit of calcium carbonate. In the second region, which covers the rest of the land surface, coal and lignite beds have been laid down in past ages, and in all the clays, muds and marls there is usually a large admixture of terrestrial organic remains, and deposits from such lakes can be recognised. They do not contain any salt deposits, and the aspect of the sandy particles is different. Lakes in this region are not numerous except where there has been recent glaciation or earth movements. The generalisations in this article are important, and are such as could only have been made by one possessing Sir John's world-wide knowledge and experience.

The volume also contains a "Summary of our Knowledge regarding Various Limnological Problems," by Dr. Wesenberg-Lund, who is Director of the Freshwater Biological Laboratory of Copenhagen University, and one of the greatest authorities on lake plankton. The task which Dr. Wesenberg-Lund sets himself is to bring together the available information concerning the topography and general geography of the Arctic, North European, Central European lakes of the level country (Baltic lakes) and the Alpine lakes, to give a sketch of the plankton com-

Lochan Creag Madaidh, Perthshire, a typical highland loch surrounded by moor. [*Photo by Mr. Geo. West.*

munities, their geography and life history, and to suggest the most profitable lines for future investigation. He visited Scotland while the Survey was in progress, and so is conversant with the characteristics of Scottish Lakes. His article, though chiefly biological, shows a wide acquaintance and sympathy with the various branches of limnology.

In the first part of the paper, dealing with the general geography of lakes, a great quantity of material is brought into line, and the characteristics of the lakes in the various zones are considered from the point of view of size and shape, vegetation, character of drainage area, temperature conditions, chemistry, colour and transparency of the water. Attention is also drawn to the importance of the fact that the viscosity and the specific gravity of water vary with temperature. At 25° C. the viscosity of pure water is just half as great as at 0°. This fact has not hitherto, so far as we are aware, been considered by limnologists. Its importance from Dr. Lund's point of view is that the supporting power of the water for plankton also varies with the specific gravity and the viscosity.

This point is developed in the part of the paper which deals with plankton communities. Owing to their form-changing power the organisms are able to adapt themselves to the variations in the rate of sinking. The supporting power of fresh water is thought to be different in different latitudes, and to diminish from north to south, and it is found that the variability of the species is not equally great in the Arctic and high Alpine lakes, is slight in the North European lakes, and is greatest in the Baltic lakes, *i.e.* the variability is greatest where the variations in the supporting power is least, for in the Baltic lakes the range of temperature is comparatively small. It is also shown that in general a decrease in the volume of organisms takes place from north to south, and there is therefore a relative increase in their superficial area. This also tends to decrease the rate of sinking of organisms. In tropical fresh-water plankton there is a distinct tendency towards a roughening of the surface, but no organism has yet been observed in fresh-water lakes, which increases its resistance to sinking by the throwing out of floating apparatus as salt-water organisms do. Fresh-water organisms meet the demand for diminishing the rate of sinking by increase in superficial area through decrease in volume, and salt-water organisms by an increase in cross-section resistance by means of an extensive formation of spines, skin-folds, etc.

In conclusion Dr. Lund draws attention to our comparative lack of knowledge of the lakes of the tropics, and he is of opinion that a thorough exploration of one of the great tropical lakes is one of the most desirable objects for the promotion of limnology. At the same time he urges the necessity for simultaneous observations being made on lakes in different latitudes with a view to correlating the results, but before such observations can be of value a thorough knowledge of the lakes which are chosen is necessary, otherwise undue importance may be given to observations which after all only show some local peculiarity, and we are not satisfied that Dr. Lund is sufficiently alive to this. Simultaneous observations in lakes, widely distant, differently situated, and

made at considerable intervals of time, seem to us in the present state of our knowledge of doubtful utility.

Dr. Lund is on safer ground when he advocates the causes of fresh-water biological stations at which the regular study of a single organism on the spot where it lives and where it grows is the chief task. The laboratories should be in touch with University centres. "University education as it now is, usually diverts the student from living nature: the young naturalists produced by the Universities have a much more intimate knowledge of nature preserved in alcohol and formalin. When they leave the Universities stained and embedded nature is much more likely to occupy their attention and arouse the spirit of inquiry than living nature. It is the study of the living organisms in nature itself which must be regarded as an independent phase in nature study. In my opinion it is just this study we need, and the fresh-water and marine laboratories should make it their first aim to bring it into existence."

The remainder of the contributions to Volume I. are confined to special departments of lake work, and are contributed by those who have given much time and study to the various problems.

Professor Chrystal has added to the many subjects which at various times he has enriched not only by developing the mathematical theory of seiches, but also by giving a model of what a seiche investigation of a lake should be. His paper on "Seiches and Other Oscillations of Lake-Surfaces" summarises the work done by himself and various members of the Lake Survey.

Before the publication of Professor Chrystal's memoir on the Hydrodynamical Theory of Seiches the mathematical theory was inexact and failed to take any account of variations in breadth of a lake or of shallowing of the basin towards the shores. By Du Boys' formulæ, the calculated periods of the seiches gave wonderful agreement with the observed periods for simple basins; but the method was obviously inexact. By means of the formulæ deduced by Professor Chrystal we are able to calculate with an accuracy depending on the accuracy of our data what the seiche period will be—the calculations may be and often are excessively tedious, but their possibility marks a great advance.

With a view to testing his theory, Professor Chrystal organised an elaborate investigation of Loch Earn. Three limnographs which constantly recorded the level of the lake were installed, and the most efficient of these was designed by Professor Chrystal himself. In addition there were a number of portable instruments and a whole battery of meteorological instruments for the purpose of correlating denivellations of the lake surface with meteorological phenomena.

With the result all concerned have good reason to be satisfied. The seiche periods observed agreed very closely with the periods which had been calculated by Professor Chrystal and Mr. Wedderburn, and much information as to the cause of seiches was gathered.

Professor Chrystal mentions eight causes which may generate seiches:—

(1) The sudden release of a static denivellation of the whole lake

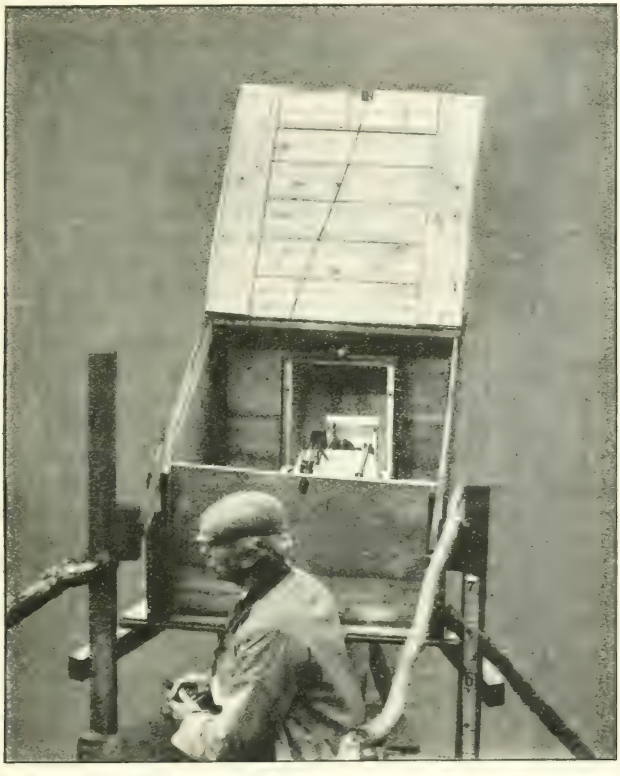
surface, due to the progression of the general system of the atmospheric isobars.

(2) Sudden release of a denivellation, caused by the transport of water from one end of a lake to the other by a wind which has blown in one direction for a time and then fallen calm or changed its direction.

(3) Rapid flooding at one part of a lake.

(4) A heavy fall of rain over part of the lake.

(5) Sudden alteration of the atmospheric pressure due to the passage over parts of the lake of a local atmospheric disturbance.



Professor Chrystal and his "waggon recorder" limnograph, as mounted in position by the side of a lake.

(6) The impacts of wind-gusts on the lake surface.

(7) The action over portions of the lake surface of small fluctuations of barometric pressure which happen to synchronise more or less nearly with some of the seiche periods of the lake.

(8) Similar fluctuations in the velocity and pressure of the wind.

Numerous laboratory experiments have been carried out at Professor Chrystal's instigation with conformable results. In addition to the seiche

oscillations, there are also other kinds of denivellations of a lake surface, and all of these are carefully discussed.

One test of work of this kind is the manner in which it stimulates other investigators, and estimated in this way Professor Chrystal's work is of the greatest value, for we find that in the last few years numerous continental observers have undertaken elaborate seiche investigations, and in all cases which have come to our notice the observations which have been made have fallen properly into line with Professor Chrystal's mathematical theory.

A paper on the "Temperature of Fresh-Water Lochs" is contributed by Mr. E. M. Wedderburn, in which the classification of lochs according to temperature is discussed, and a general account is given of the various factors which require to be taken into account in considering the temperature changes which occur in a loch and the manner in which a loch gains and loses heat. It is now a considerable time since Sir John Murray's observations were made on the effect of winds in carrying warm surface water to the lee end of a loch, but later observers did not seem to realise the importance of his results, and not much progress was made with the study of temperature changes for a few years.

In 1903 and 1904, however, a great number of observations were made in Loch Ness. A small yacht named the *Rhoda* was moored close to Fort Augustus in 300 feet of water, and continuous observations were made from this boat day and night for a considerable period—a new method of lake survey. These observations showed the presence of short-period temperature changes of considerable amplitude in autumn; these changes were also shown to be periodic, and the suggestion was made that they were due to an *internal seiche*. In autumn the temperature distribution in a deep loch is peculiar. There is at the surface a layer of water of nearly uniform temperature the thickness of which varies with the particular characteristics of the loch. Below this isothermal layer there is for a comparatively short distance a rapid change of temperature, and below this again an isothermal layer reaching to the bottom of the loch. The suggestion made by the observers was that the periodic temperature changes which were observed were due to a seiche in the lower isothermal layer, just as you may have an oscillation in a layer of water on the surface of which floats a layer of oil or of some lighter liquid. In the case of lochs the two layers are cold bottom water and lighter, warm surface water. Subsequent laboratory experiments and observations in Loch Garry by Mr. Wedderburn and in the Wolfgangsee by Dr. Exner have given confirmation of the theory originally propounded. The period of the oscillation admits of rough calculation by mathematical formulæ. The discovery of this temperature seiche marks a real advance in our knowledge of the physical conditions of lakes, and must also have an important influence on the movements and development of plankton. Long-period oscillations of temperature have also been observed in the ocean, and a satisfactory explanation of these has not yet been given by oceanographers. Mr. Wedderburn considers it very likely that they can be explained in the same way as

the temperature seiche in lakes—*i.e.* as an oscillation due to the difference in density of successive layers of water.

Mr. Wedderburn also refers to observations made by him on currents in lochs—both experimental and in the field. It appears from these that in winter even the deepest lochs are thoroughly mixed up by wind action, but that in autumn the currents directly produced by the action of wind are practically confined to the surface isothermal layer. Reference is also made to the part which the change of the viscosity of water with temperature may play in determining temperature changes and currents.

The paper concludes with a short comparison of Scottish lochs from the point of view of temperature. Temperature observations were made in the various lochs surveyed, but as the surveys were carried out in successive years and at various periods a comparison—other than a very general one—was not attempted. A tabulated statement giving interesting information about the occurrence of ice on our larger lochs is given.

Dr. W. A. Caspari contributes one paper on the "Chemical Composition of Lake Waters," and another on the "Deposits of the Scottish Fresh-Water Lochs." In the former paper, after a discussion of the differences between lakes which have an outlet and those which have none (salt lakes), the author draws attention to the scarcity of information about gases dissolved in lake waters. For sea-water we have much information, but limnologists have not so far paid serious attention to the matter. Some observations in Lake Geneva are available, and more recently the question has engaged the attention of Professor Birge in America. The quantity of gas in solution in any part of a lake depends on the extent to which wind-produced currents are effective in mixing up its waters, and therefore seasonal variations, depending on the temperature distribution of the water, are to be expected. The quantity of oxygen in solution is important for animal life. A defect of oxygen means a scanty fauna, and this may have important economic effects. On the other hand, chlorophyll-bearing plants consume carbon dioxide and give in return oxygen.

Dr. Caspari's paper on Deposits contains an interesting comparison between loch and oceanic deposits. In the ocean dead calcareous shells (*Globigerina Ooze*) form an important part of the deposits, and in lakes are quite inconsiderable. Ferruginous deposits are essentially similar in lochs and in the ocean, but in the ocean by the decomposition of organic (animal) waste within them they become intimately mixed with carbonaceous matter, iron also is reduced to the ferrous state, and ferrous sulphide may be formed giving rise to the characteristic Blue Muds, which are not found in our lakes. The organic contamination in lakes is due to decaying vegetable matter which, owing to the comparative absence of abyssal fauna, does not become degraded to the condition of Blue Mud.

There is no appreciable organic matter in deep-sea deposits. The little that reaches the bottom is rapidly oxidised away or consumed by the bottom-living fauna. In lakes the supply of organic matter is greater than the available supply of dissolved oxygen can cope with.

The results of Mr. George West's Botanical Survey have already been noticed in the *Magazine* (vol. xxii. p. 213; and vol. xxvi. p. 198), so that a short reference is all that is needed here. Mr. West has accumulated

much material, and the result is a list of plants which occupies twenty-five pages of print. But his work has not been limited to a mere catalogue of the specimens collected, but the effect of varying conditions on the flora of lochs is carefully discussed in a very readable manner. The two great factors which determine the distribution of the plant-covering over the surface of the earth and throughout its waters are food and climate—factors which are by no means independent of each other. In our Highland lakes the presence of humic (or peaty) acid is a very important factor. Its presence excludes a number of plants which might otherwise thrive. Humic acid, on the other hand, acts as a preservative against the decay of organic remains, and in this way shallow places about peaty lakes are quickly reclaimed by the growth of land-winning plants. The peat extract also darkens the water, and so limits the depth to which light can penetrate and where plants can grow. Mr. West gives the maximum depth at which plants, such as *Nitella opaca* and *Fontinalis antipyretica*, will flourish as roughly four times the greatest depth at which the bottom is visible. He divides the depth to which light can penetrate into three zones—(1) The photic zone, throughout which there is sufficient light for the proper development of the higher flora; (2) The dysphotic zone, in which a few of the higher plants may struggle to exist, but which is normally occupied by members of the lower cryptogamic flora; and (3) The aphotic zone, in which no light-demanding organisms can exist. The direct effect of climate is felt in various ways—by the prevailing winds producing waves which exert an erosive action on the lee shore—by producing large variations in level which are inimical to plant life—by producing variations in the water temperature, and in many other ways. The paper is illustrated by many beautiful and interesting plates, some of which we have been kindly permitted to reproduce here. The view of Loch Ness illustrates well the effect of waves breaking on a gravelly beach, and shows Lake Survey yacht *Suzan* at her moorings.

Probably none of the Lake Survey assistants has made a greater reputation for himself through his lake work than Mr. James Murray. His paper on the "Biology of Scottish Lochs" concludes with an apology for the incompleteness of his work, on account of his leaving Scotland as a member of Sir Ernest Shackleton's Antarctic expedition. But no apology is needed.

Biological collections were made in nearly all of the 562 lochs surveyed, and more than 400 of these have been examined. The result of Mr. Murray's "Census" is a total of 447 different species of animals, all Invertebrata, and 277 species of plants. Of these 29 species were previously unknown, and practically the whole of the Tardigrada (30 species) and 25 species of Rotifera are additions to the British fauna. Three species of Crustacea were found for the first time in Great Britain, one being previously known in Ireland, and there are many other additions to the British lists.

A very interesting experiment was conducted by Mr. Murray. When the Talla reservoir for Edinburgh was constructed—separated by many miles from any other lake, an examination of the water was made several times during the first year, and in the course of a few months

many of the cosmopolitan species found their way in and increased till they were as numerous as in an old established loch. Eggs and spores of many of the species can be dried up without any injury, and may be carried through the air as dust from one lake to another. Others may be conveyed among mud adhering to the feet of aquatic birds, and in various other ways. So great is the facility with which plankton species can be transferred from one lake to another, that the chief difficulty has been to account for the restricted distribution of certain species. Of the origin of the fauna and flora Mr. Murray writes: "As no [marine] relict fauna has yet been found in the lakes, there is no reason for supposing that any part of the lake-fauna has had a marine origin,[1] or has come through the intermediary of a great inland sea or lake, such as has been postulated to explain the distribution over the great European plain, and as there is likewise no peculiar abyssal fauna, or peculiar forms at all in the lakes, the tracing of the origin of the population found in them now is comparatively simple. Ordinary migration will account for the greater part of it, and this may be extremely rapid. The admixture of Arctic and southern forms may be accounted for by changes of climate, the Arctic species coming south during a cold period. The abyssal fauna, clearly derived from the littoral, and not at all modified, may have originated quite recently.

"These conclusions agree perfectly with those of Professor Forel, though in the Lake of Geneva the abyssal fauna has undergone some modification. The biology of the lakes indicates a very recent origin."

Other biological papers are contributed by Mr. John Hewitt, B.A., on "Some Distinctive Characters in the Fresh-Water Plankton from Various Islands off the North and West Coasts of Scotland," and by Mr. William A. Cunnington, M.A., Ph.D., "On the Nature and Origin of Fresh-Water Organisms." In the former paper Mr. Hewitt describes the differences between certain species as found in the western islands, and in Orkney and Shetland. The western islands plankton is very like, though not identical with that of Ross-shire, whilst the Orkneys and Shetland have a more distinctive plankton. The differences, however, are small, being varietal rather than specific. The bearing of the temperature of the water on these variations is discussed, but it does not appear that they can be wholly accounted for in this way.

Mr. Cunnington addresses himself to the problem of the ultimate origin of fresh-water organisms, and concludes with the confident assertion that they are the modified descendants of marine ancestors. The modification may have taken place in numerous ways. From this point of view the biology of the Caspian Sea, which may almost be considered a fresh-water basin, is very interesting. Yet the fauna includes many forms which are typically marine. During the early part of the Tertiary period, the Caspian seems to have been in open communication with the ocean. Since then it has become gradually cut off, and its waters have gradually freshened. If this is the case, it is not difficult to believe that the marine forms which are found have persisted in the

[1] *i.e.* a direct marine origin.

lake since it was actually a part of the ocean. In the same way the marine relicts which are found in many lakes are doubtless also to be explained. It is not difficult to imagine why certain marine forms have no fresh-water descendants. Some may be very sensitive to changes in salinity. Some may be able to swim against the currents of rivers and so establish themselves gradually in fresh water by actual migration. Others again may have begun by becoming terrestrial or swamp-loving, secondarily adapting themselves to fresh water. But the difficulty is not so much to account for the occurrence of some marine descendants in fresh water as for the absence of others, and this Mr. Cunnington considers among the most profound of Nature's problems—the complex effects produced on living matter by the influence of animate and inanimate surroundings.

The Geological Survey and the Lake Survey have throughout been in close touch. Indeed when a systematic survey of lakes was first mooted, results of geological importance were chiefly aimed at. Fortunately the scope of the survey was widened to include physical and biological questions, but geological considerations maintained an important place.

The relation of Scottish lakes to the geological features of the country is discussed by Dr. Peach and Dr. Horne, of the Geological Survey, and Sir John Murray and Mr. Pullar are to be congratulated on their co-operation. Their paper commences with an account of the geological structure of the country and of the development of its topographical features prior to the Ice Age. Thereafter the successive stages in the glaciation of the region are described, and their relation to the distribution of Scottish lakes is discussed. The lakes are divided into seven groups according to their origin :—

i. Lochans lying in hollows in, or surrounded by, peat.
ii. Lakes due to the action of wind by creating sand dunes or by the removal of disintegrated rock.
iii. Lakes due to river action.
iv. Lakes due to wave action on the seashore.
v. Lakes caused by chemical action on limestone plateaux.
vi. Lakes resulting from the irregular distribution of the drift : (1) those lying in boulder clay ; (2) those resting on morainic deposits ; (3) those situated partly on drift and partly on solid rock ; (4) kettle holes caused by the accumulation of fluvio-glacial sand and gravel round isolated masses of ice during retreat.
vii. Lakes occupying rock-basins : (1) plateau rock-basins ; (2) valley rock-basins ; (3) corrie rock-basins ; (4) those lying along shatter belts due to faults.

By far the greater number of Scottish lakes are included under the last two groups, and, except for those lying in true rock-basins, there is little room for controversy regarding their origin. A careful consideration of all the available evidence leads to the conclusion that the distribution and form of these rock-basins bear a direct relation to the geological structure, topography, and glaciation of the particular regions in which they occur, and that such basins merely represent a phase of the differential erosion of the whole country by the action of land ice.

Volume I. concludes with a bibliography of limnological literature, extending to nearly 100 pages, compiled by Mr. James Chumley, Secretary to the Survey. And this is not the only work which Mr. Chumley has done in connection with the publication of these volumes, for he took a large part in the preparation of manuscripts (especially of the lake descriptions which fill Volume II.), and in the correction of proof sheets. He superintended and was responsible for the planimeter measurements of loch basins by other assistants. His previous experience as assistant to Sir John Murray in the preparation of the *Challenger* Reports qualified him in a very special manner for these duties.

Mr. Chumley does not claim either absolute accuracy or exhaustiveness for his bibliography, but it cannot fail to be of great service to all who are interested in limnology. No complete bibliography of limnological literature has hitherto been published, and in consequence many investigators start off in ignorance of work which has already been accomplished. *The International Review for Hydrobiology and Hydrography* now publishes a supplement containing a list of the limnological literature of the year, so that any one starting with Mr. Chumley's bibliography as a foundation, and referring to these supplements, can with comparative ease acquire a knowledge of what has been accomplished by earlier investigators.

The work is a fitting monument to the memory of Mr. Fred. Pullar, and one which we are assured will be of permanent value. The keynote of all the special articles which have been published is not so much a record of work done as an indication of the most profitable lines of future research, and they should for this reason be consulted by all who are actively engaged in limnological work—and also by oceanographers, for limnology is truly a branch of oceanography which deserves greater study from oceanographers than it has hitherto received.

The work of the Lake Survey was such as might have fittingly been undertaken by a Government department, but all efforts to secure this were ineffectual. In retrospect one can hardly regret that the work was reserved for private enterprise, for great freedom was given to the observers and surveyors to carry on independent investigations, and it is unlikely that the work would have been so satisfactorily accomplished under the direction of a Government department.

A NEW TREATISE ON PHYSICAL GEOGRAPHY: A REVIEW.[1]

By Geo. G. Chisholm, M.A., B.Sc., Lecturer on Geography, University of Edinburgh.

This is a work of the first importance for all who desire to keep abreast of the time in the subject of which it treats. It claims notice in virtue

[1] *Traité de Géographie Physique.* Par Emmanuel de Martonne, Professeur de Géographie à l'Université de Lyon. Paris: Librairie Armand Colin, 1909. Prix, 22 *fr.*

of its mere extent. It is indeed smaller than Peschel's *Physische Erdkunde*, but that work is necessarily in a large measure out of date, but no recent work on the subject is larger. It is of about the same size as the fourth edition of Supan's *Grundzüge der physischen Erdkunde*, if we reckon merely the extent of the enumerated pages, but the present work has 48 additional plates, besides two folded maps, as against 20 plates and one folded map in Supan. It is about one-third larger than Salisbury's *Physiography*, which has no plates or maps out of the text.

Of the 864 pages which make up the body of the book, apart from indexes and preliminary matter, nearly a hundred are devoted to what the author entitles *Notions générales*, under which heading are given a sketch of the evolution of geography, an account of the form and cosmic situation of the earth, a statement of the principal methods of representing the surface of the earth, apart from inequalities of level but including the methods of ascertaining the data to be represented, and a sketch of the elements of physical geography. This constitutes the first part. The second part, extending to upwards of 250 pages, is devoted to climate; the third part, 110 pages, to hydrography; the fourth, about 340 pages, to the relief of the surface, including the representation of relief by contour lines, hachures, etc.; and the fifth part, rather more than 160 pages, to biogeography. As the fourth part contains one chapter on the cycle of fluvial erosion and another on the evolution of relief and the hydrographic system, a certain amount of repetition is involved in the latter chapter, and the arrangement of the matter leads to repetitions elsewhere. Still this causes no real inconvenience. For the most part the treatment of the subject is admirable, and everywhere it shows amazing industry. As to the great wealth of illustration which forms one of the most important features of the volume, nothing need be added to what has been already said on that head on pp. 102-103 of this year's *Magazine*. Of the folded maps, both maps of the world on the equivalent projection of Mollweide, one is a climate map with twenty-six signs for different climates, and the other is hypsometrical and bathymetrical. For those who wish to go beyond the text an excellent feature of the work is the numerous references to books, papers, periodicals, and topographical maps at the end of each chapter. There are separate indexes of authors and subjects.

The work is assuredly excellent. But it is the best that one would like to see made better. It would be an extraordinary book in which could be found no room for improvement, and we venture to suggest for the author's consideration one or two points that might possibly be attended to in a new edition. Large as the book is already we should like to see the filling up of two or three gaps, which perhaps would not have existed if the author had arrived at a clearer understanding of the nature of his subject. On that he does not seem to be quite at one with himself. His formal dicta on the nature of geography will hardly bear a strict examination. He says, p. 21, after commenting on the closeness of the bonds between geography and geology, that the difference between the two is one of method rather than of object. He then goes on to enumerate three principles of method which distinguish geographical

from other kinds of scientific investigation. The first is the principle of extension, the second the principle of co-ordination, the third the principle of causality. Commenting on the principle of co-ordination, he says that, however conscientiously one may study the erosion of a cliff, one remains a geologist and one's labours do not acquire a geographical value until one brings the observed facts into relation with the general laws of marine erosion. But surely one does not cease to be a geologist in doing that, or take one step out of the field proper to geology? Then on p. 23 he sums up with a definition of geography to this effect: "Modern geography asserts itself as the science of physical, biological, and social phenomena considered in respect of their distribution over the surface of the globe, their causes, and their reciprocal relations." This is a statement of something more than method as the distinguishing character of geography. It is a statement too in which the author manifestly expresses more than he means. To include, for example, the causes of biological phenomena generally within the field of geography is a claim that no one would make deliberately. It may be well therefore to turn to the body of the book to see what light is thrown on the author's conception of geography by incidental remarks or by his practice. On p. 31 he remarks, after stating the dimensions of the earth, that the astronomer would compare it in point of size with the other planets, but the point of view of the geographer is quite different. He must consider what the dimensions of the earth mean as regards human activity. On p. 177, after stating the meaning of a pluviometric coefficient (the ratio of the average rainfall for a particular month to the average rainfall of a month on the supposition of a rainfall equally distributed throughout the year), he observes that such calculations are rather meteorological than geographical, as giving no sure indication of dry periods, an observation which must be taken in the light of his previous references to the influence of such periods on vegetation and man. On p. 225, after his enumeration of the different types of climate, he goes on to say that it is scarcely necessary to indicate the innumerable effects of this distribution of climates on all the phenomena of the life of the globe, as well as on the changes in the surface of the earth due to weathering and erosion. We find him (p. 355) calling special attention to the utility for irrigation of the Trans-Caspian type of rivers, to the inutility of such "magnificent hydrographic organisms" as the Obi, Yenisei, Mackenzie, etc., pointing out (p. 667) that loess, even when of æolian origin, may be more widely distributed by running water "without losing the essential characters which constitute its geographical importance," the text showing that the characters referred to are those which make for fertility; and insisting again and again between pages 689 and 698 on the difference made to man by different types of coasts.

From these and numbers of other passages that might be cited we may gather that what the author really means by his definition of p. 23 is that it is the business of geography as a science to study the distribution of all the kinds of phenomena there mentioned in so far as one set of distributions is causally related to another, and that in this study a very prominent place must be taken by the local influences affecting

man. And if that is his meaning his definition when so modified as to express that meaning may, perhaps, be taken as unexceptionable, but then, it must be added, it distinguishes geography by something more than a method. It gives it a distinct aim.

And if that modified definition is accepted no one, probably, will be disposed to challenge the contention in his preface that physical geography appears as the basis even of labours devoted to human geography, nor will any one claim that physical geography studied only as that basis covers the whole field of geography. One must recognise, for example, that physical geography is an essential propædeutic for geology as well as human geography.

Still one would like to have seen the importance of the latter aspect of physical geography, so constantly recognised by implication in the body of Professor de Martonne's work, and expressly included in his definition, more fully taken account of in the general plan of the work. In that case it is not improbable that, to give one instance of the gaps above referred to, we should not have found Professor de Martonne following the example of other writers on physical geography in bestowing most attention on snow where it is of least importance, namely at high altitudes, and saying very little about its occurrence at ordinary levels. It is indeed rather surprising that the main results of Mr. Woeikof's elaborate paper entitled *Der Einfluss einer Schneedecke auf Boden Klima und Wetter*, published as far back as 1889, have not yet found their way into the larger and even some of the smaller treatises on physical geography. The work now under review is the only one that we remember even to have mentioned it, but the half-dozen lines on p. 172 in which the range of influence of lying snow is just indicated, are far from enough to do justice to that paper, and there is more to say on the subject in a general treatise on physical geography than falls within the scope of the particular publication referred to. Strange to say, Professor de Martonne's citation of this paper does not come at the end of the chapter in which its conclusions are glanced at, but in an earlier more general chapter on climate.

Another subject that one would like to have seen more fully treated on account of its interest in human geography is that of desiccation. The brief observations thereon made on pp. 226 and 668 seem to us judicious, but hardly sufficient even as a guide to the student.

A third extension seems desirable under the head of biogeography. Unquestionably Professor de Martonne's treatment of this subject, especially in the case of the geography of plants, is strictly geographical, but over and above that treatment one would like to have seen more about the flora and fauna of the earth in relation to its effects on man, such a treatment of the subject as one finds in Ratzel's *Anthropogeographie*.

It may seem to be asking a great deal when we express a wish to have a big book made still bigger, but it may be that some of the necessary space might be found by omissions elsewhere. Somewhere or other, we cannot recall where, Professor de Martonne hints some misgiving that he is trenching too much on the sphere of the geologist,

and if that is so there may be found in those parts the means of making excisions for the sake of the matter above indicated.

But there are defects of other kinds that we hope to see remedied in a new edition. Occasionally there is a lack of precision in expression to be regretted in a book intended for students. The definition of geography already quoted is one example. The statement on p. 167 that "radiation [of heat] takes place only in the lower strata of the atmosphere on a clear night, generally in a period of high barometrical pressure and of calms" is sure to mislead some students. Lower down on the same page we have the statement that if a mixture of two masses of air differing in temperature takes place and one of the two is near the point of saturation condensation may take place. This would have been more satisfactory had the statement run, "and if that at the higher temperature is near the point of saturation then," etc. On p. 109 he remarks that the transparency of the air depends on its degree of humidity, whereas the context makes it obvious that what he refers to is the diathermancy of the air. The references to climate cycles are rather perplexing. On pp. 226-7 mention is made of various phenomena, including the variations of level of African lakes, indicating fluctuations of climate, followed by the remark that according to Brückner all these sources of information combine to reveal variations of climate really periodic, and that this period is given as one of thirty-five years. Parenthetically we may observe that, so far as we are aware, this is rather more than Brückner has ever claimed. What we understand Brückner to profess to have demonstrated is that there are world-wide fluctuations of climate for which an average of thirty-five years can be calculated by purely empirical methods. However that may be, Professor de Martonne on p. 335 again refers to the fluctuations in level of the African lakes, and states that the period of that fluctuation appears to be one of twenty-five years, and then on p. 336 speaks of the variations in the lakes of western North America as confirming according to Brückner the existence of oscillation of climate in a period of thirty-five years.

Further it may be suggested that the illustration in Fig. 93, p. 239, of inversions of temperature in January round Klagenfurt with the comments upon it should be removed from the next edition even though Professor de Martonne gives the necessary warning against it. He tells us that the degree of inversion is exaggerated in the map by using 0°·5 C. per 100 metres as a multiplier for reducing the temperatures to sea-level. But inversions of temperature are actually observed deviations at a particular time or a particular period from a normal average, and if, instead of showing what these observed deviations amount to, you use a more or less arbitrary multiplier to alter the observed figures, it is true enough that you may thereby exaggerate the contrasts, but in reality you simply misrepresent the facts.

It should also be noticed that the list of errata at the end is not complete, and there seems to be an exceptionally large number in the mathematical section. The author has noted one error in his account of the sextant on p. 48, but he has failed to point out his error in

placing the telescope on the movable arm of the instrument, which would thereby be rendered useless. His own illustration shows that if the telescope were so fixed a forward movement of the arm would drive the telescope through the lower mirror. (On the other hand, we may notice in passing that the account of the theory of the theodolite immediately following is admirably compact and lucid.) As to the sextant, it may be noted further that it was not invented by Halley in the early part of the seventeenth century, as stated on p. 47, but by Hadley early in the eighteenth. In Fig. 12 on the same page ϕ is placed in the wrong angle. On the opposite page the difference in time between Greenwich and Paris is given as 8 instead of 9 minutes 21 seconds. 0 is omitted from the figures on pp. 49 and 50. On p. 71 is a table containing a number of columns giving data for useful exercises in projections, but unfortunately there is no explanation of the column numbered five (which, we find, gives in kilometres the length of arcs measured on a meridian from the equator at five-degree intervals from 5° to 90°). Unfortunately too there is no explanation of an unnumbered column, which forms the standard of reference for the other seven columns and gives every fifth degree from 0° to 90°. To agree with columns 3 to 7 these must be taken to read from the equator (0°) to the pole; but if that is the meaning then the figures in the columns numbered 1 and 2 must be reversed from top to bottom. On p. 204, l. 6, *réelle* seems to have been printed for *que celle*. On p. 91 reference is made to the disastrous landslips due to earthquake shock in Calabria in 1873. Should this not be 1783?

THE FORM OF THE ANTARCTIC CONTINENT.

(*With Sketch-Map.*)

We noted here last month (p. 206) the fact that Lieut. Filchner contemplates leading an expedition to the Antarctic area. Lieut. Filchner's plans were brought before a meeting of the *Gesellschaft für Erdkunde* at Berlin, and in speaking in support of them, Prof. Penck delivered an interesting address on the probable form of the Antarctic Continent—the problem which the German expedition hopes to solve. This address is reported in the *Zeitschrift d. Gesellschaft f. Erdkunde*, 1910, 3, and we quote here the gist of Prof. Penck's remarks. They can be readily followed with the aid of the accompanying sketch-map, which we are enabled to reproduce by the courtesy of the *Gesellschaft für Erdkunde*. It will be found interesting to compare this conception of the form of Antarctica with that put forward by Sir Clements Markham (cf. this *Magazine*, xxi. 378).

The result of the Antarctic expeditions of recent years has been to amass a vast number of proofs for the existence of a Southern Polar Continent. The ocean in the vicinity of the Antarctic circle becomes everywhere shallower, finally land rises out of the water, land which is

covered with an enormous inland ice-mass, below which only a narrow fringe of uncovered earth projects. This ice-covered land is a region of high air-pressure, and is swept by characteristic east winds. This is the case everywhere along the edge of East Antarctica—in Victoria Land, and at the Gaussberg. In West Antarctica, on the other hand, east

The Antarctic Regions. The dotted line shows Lieut. Filchner's proposed route, the darker shading indicates known land, the lighter unsurveyed regions of probable land, while the region which Prof. Penck believes to be sea has been left unshaded.

winds are only occasional, and at Snow Hill, where Nordenskjöld wintered, they are unknown, none but south-west winds blowing. These point to the existence, to the south-east, of an area of low pressure—of a sea. As early as 1823 Weddell had penetrated far into that sea, but later attempts failed, because as a rule the attempt was made on the west side of the Weddell Sea. Here ice seems regularly to stretch as

far as 65° 30′ South, and violent winds blow from the Pole. Different conditions prevail on the east side. Here, in 1904, the Scottish Antarctic Expedition, under Dr. Bruce, was able to advance beyond 74 degs. south towards the then undiscovered Coats Land, which now offers what is presumably an easily attainable starting-point for further Antarctic exploration. Here the Scottish and American expeditions intend to start, but while they wish to reach the Pole, Lieut. Filchner places another problem in the foreground—namely, to clear up the relations between East and West Antarctica. Are they united or separated? Both cases are conceivable. It can easily be imagined that the coastline stretches from Coats Land, south of the Weddell Sea to Graham Land, and from Alexander I. Land by way of King Edward VII. Land to Victoria Land. But it must not be left out of sight that the ice barrier discovered by Ross between King Edward VII. Land and Victoria Land, is a detached portion of a floating ice-mass, as was shown by Captain Scott. This rises and sinks with the tides, and has a strikingly even surface, which only rises gradually towards the south. As far as Scott advanced over the surface of this ice-mass—*i.e.* beyond the 82nd parallel—he believed it to be floating, and near the 84th parallel, 650 kilometres from the coast, Shackleton found its height to be 150 metres, while farther west the land rises sharply to a height of upwards of 3000 metres. This precipitous land-wall, at the place where Shackleton climbed the inland ice, stretches out in a south-easterly direction—*i.e.* towards Graham Land—but its general course points towards Coats Land, and the violent south winds which impeded Shackleton's advance seem to indicate that the route of his arduous march over the inland ice lay always in the vicinity of this towering land barrier. If this theory is correct, the South Pole must be situated in East Antarctica, and the shape of the East Antarctic land mass must be regarded as a flat shield of earth sinking gradually down towards the eastern hemisphere, but breaking sharply away towards the western hemisphere. The Weddell Sea on the one side and the Ross Sea on the other might be regarded as inundated portions of the shore at the foot of the precipitous coast, and between them lower-lying ice can be presumed to exist similar to that which descends towards the Ross Sea in the Great Barrier. In that case West Antarctica must be an island lying in front of East Antarctica, and separated from it by a frozen channel connecting the Weddell and Ross Seas.

Such an interpretation of our geographical knowledge of Antarctica is naturally pure hypothesis, but it is no more capricious than the usually held theory according to which the Antarctic continent consists of a single land complex. It would be idle to dispute as to which of the two hypotheses is correct. The fact that two such widely opposed theories can be put forward suffices to show that here we have a great geographical problem to solve, a problem more important than the reaching of the South Pole. It could be solved by starting from Victoria Land and following approximately the route of Scott and Shackleton along the foot of the great land-wall in order to trace its course. But such an expedition would for more than 650 kilometres be treading known

paths and would cover the same ground which is to be explored by Captain Scott's second expedition. It appears, therefore, more expedient to make the start from the Weddell Sea, where every step between 20° and 30° west of Greenwich and beyond 75° South latitude is in unknown regions. The attempt should be made to reach the southern continuation of the coast by Coats Land by ship in the Weddell Sea, and thence make a dash in sleighs for the great land-wall. With this object, the goal would not be the Pole itself, but a point in 90° West longitude some degrees north of the Pole. From this point the Ross Sea at Mount Erebus would be nearer than the starting-point of the journey, supposing the latter to be not far from the now known coast of Coats Land. To traverse Antarctica from side to side would therefore be a less difficult undertaking than a dash to the above-mentioned point and a return thence to the starting-place, especially as, thanks to the Shackleton Expedition, the route from 84° S. to Mount Erebus is already known throughout and suitable places for provision depôts exist, as, for example, at Cape Allen. For a trans-Antarctic journey of this kind an auxiliary expedition is necessary, which would go to Victoria Land and establish provision depôts along the final stages of the trans-Antarctic journey. Without this auxiliary expedition the sleigh expedition would have to return, perhaps making a detour, to its starting-point.

The Distribution of the Towns and Villages of Scotland.—The concluding part of Mr. Cossar's article on this subject has been unavoidably held over till the June issue.—Ed. *S.G.M.*

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

At a meeting of Council held on April 5 a resolution was passed stating that the support which the Society is extending to Dr. Bruce's Antarctic expedition does not include the acceptance of any financial responsibility for this expedition.

OBITUARY.

Angus MacEwen Peach, B.Sc.

Our sincere sympathy goes out to Dr. Benjamin N. Peach and his family, whose son, Angus M. Peach, died in Egypt on December 28th, 1909, when every sign of a brilliant future as a geologist and explorer lay before him.

Angus Peach was born on the 6th July 1888, and was educated at George Watson's College and the University of Edinburgh, passing his

B.Sc. in Natural Science only one day before he left Edinburgh as geologist to the Scottish Arctic Expedition, 1909. His career as a student was brilliant. He was specially interested in geology, and often accompanied members of the Geological Survey in the field. Early in the summer of 1909, at the instance of Mr. E. B. Bailey, he undertook a bit of independent field research. He followed the distribution of boulders from an exposure of Essexite, a conspicuous intrusive igneous rock near Lennoxtown in the Campsie Fells. He was thus enabled to demonstrate the eastward track of the ice sheet during the period of maximum glaciation ("Boulder Distribution from Lennoxtown, Scotland," by A. MacEwen Peach: *Geological Magazine*, vol. vi. No. 535, January 1909).

In the summer of 1909 Angus Peach accompanied me as one of the geologists of my expedition to Prince Charles Foreland and other parts of the west and north-west of Spitsbergen, and made a special study of the raised beaches and the coastal platform of Prince Charles Foreland. In October he was appointed geologist to the African Prospecting Syndicate in search for mineral oil in Egypt. He reached Cairo on November 1st, and proceeded to Jebel Zeit on the 6th. After studying the raised beach, raised coral reef, and volcanic rocks there exposed, he proceeded on 14th November to the branch camp at Ras Bahar on the shore further down the Red Sea. Here he worked along with two other Europeans and about twenty natives. Peach's work was to map out the geology of the vicinity and to examine the shafts that were being sunk. Up to December 12th he was well, but was then taken with dysentery, and died on the 28th after a short illness, at the hospital at Suez.

There is little doubt that with his Arctic and Egyptian experiences, and the sound scientific training he had received at home and at the University, he would, had he been spared, have had a brilliant and useful career before him. W. S. B.

GEOGRAPHICAL NOTES

Europe.

The Topography of the Howgill Fells.—We can only note here, without giving an abstract, an important paper by Dr. Marr and Mr. Fearnsides on the Howgill Fells of Westmorland, which appears in the *Quarterly Journal* of the Geological Society (November 1909). The special interest of the region is that the fells, which form a well-defined geographical unit, show examples both of ice-worn valleys and of those which bear no sign of glacial erosion. The two types of erosion, by water and by ice, can therefore be studied together within a limited area. Though in no part of the area has glaciation been severe, yet typical V-shaped valleys and typical U-shaped valleys both occur. There are also numerous interesting examples of stream capture within the area. The paper is well illustrated by maps and diagrams, and may be recommended to the notice of those specially interested. It is too detailed to permit of profitable analysis in the space available here.

The Social and Economic Condition of Corsica.—Prof. Clerget contributes to the *Revue Générale des Sciences* for February 15 a somewhat gloomy account of Corsica, based in part upon various recent papers. With an area of 3377 square miles, the island, in a favourable climate, can only feed insufficiently its population of 291,160 (1906). The people are predominantly rural, only 24·8 per cent. living in the towns, but the soil is infertile and the yield small. Thus wheat only gives about nine bushels to the acre, against a mean of about twenty-two bushels on the mainland of France. This is not only due to natural conditions, but also to bad methods and the absence of machinery and farm implements. Early fruits and vegetables are hardly grown at all, though the conditions are eminently suitable. The means of communication are so bad that the wealth of minerals is of little value to the island. Forests are abundant, but deforestation is going on rapidly, and the high freights, which treble or quadruple the cost of timber at the ports as compared with its price where cut, handicap trade in all directions. Further hindrances to development are the existence of the vendetta and the mediæval notions of justice, and the prevalence of malaria. Half the population is believed to be infected with the malarial parasite, and the mosquito is allowed to breed in millions in the coastal lagoons, which are due to sand-bars at the mouths of the rivers. Drainage and improved agricultural methods are therefore the first desiderata. An attempt is now being made to attract tourists, but Prof. Clerget justly points out that this attempt is useless unless conditions are first improved. Fresh roads and railways are necessary before much improvement can be hoped for.

Asia.

Trans-Himalaya.—According to the *Athenæum*, the Survey of India Department has decided that the great central range in Tibet explored by Sir Sven Hedin is to be called in all its publications the Hedin Mountains, and not "Trans-Himalaya."

The Upper Region of Kilimanjaro.—In two recent issues of *Mitteilungen a.d. Deutschen Schutzgebieten*, Dr. Fritz Jaeger gives an account of an expedition to the Kibo Peak of Kilimanjaro. The ascent was made on the western side from the German mission station of Madschame. The station lies at a height of 4870 feet, and for about the first two hundred feet the way lay through inhabited ground with groves of bananas. At about 5000 feet begins the bracken zone, forming a broad yellow-brown band between the forest and the cultivated land. With the bracken scattered heath bushes are mingled. The forest begins at about 7200 feet, and consists largely of Podocarpus with a copious undergrowth of tree-ferns. This is the cloud zone, and the forest is excessively damp, the ground being very spongy. The trees are linked together by lianes and creepers, and are covered with ferns, mosses and epiphytes. At about 8000 feet tree-heaths appear, marking the beginning of a drier zone, the upper cloud-limit during the expedition being about 8200 feet (August). The tree-heaths gradually increase at the expense of the forest trees, but it is curious to note that the tree-ferns accompany

them upwards for a considerable distance into a relatively dry zone. The upper limit of the tree-heath zone varies with the nature of the ground from 11,800 feet to 12,800 feet, and above lies the Alpine zone. Mingled with the tree-heaths occur the other characteristic plants of these African mountains, notably tree Senecios, Lobelias, and Helichrysums (cf. this *Magazine*, xxv., p. 137 *et seq.* and p. 346 *et seq.*, and see figs. in these papers). At the highest point reached by the party, which was 14,700 feet, the vegetation consisted of lichens with a few flowering plants, such as Arabis and *Senecio telekii*.

The party made a tour of the western part of Kibo, with a view to studying especially the glaciers of the region, and also the crater. We shall limit ourselves here to a brief note of the results so far as they refer to the glaciers. These are in retreat, the decrease by melting being greater than the increase in the zone of alimentation. The shape is very different from the familiar Alpine type. The mountain is covered with a complete snow-cap, from which glaciers stream out on all sides like the rays of a halo. The glaciers have a very small zone of alimentation in proportion to their breadth, and have therefore little force, and only extend a short distance beyond the névé region. Their movement is also slight, and they have few crevasses. In the absence of any lateral compression of the ice in narrow valleys, the névé is not modified to the same extent as in an Alpine glacier, with the result that the ice of the glaciers shows in its layers, and in other respects, a strong resemblance to the névé of the snow-cap. Owing to the powerful radiation melting is rapid, so that the glaciers tend to show steep terminal walls at their lower extremities. Such glaciers, which occur elsewhere both in tropical and extra-tropical regions, cannot justly be classified as being of a "tropical type," for they owe their special peculiarities not to the climate, but to the shape of the mountains on which they occur.

The paper is well illustrated by photographs, maps and diagrams.

America.

The Shell-Mounds of San Francisco Bay.—We may briefly note here, without attempting a full analysis, a paper by Mr. N. C. Nelson on the numerous shell-mounds of the San Francisco Bay region. The paper is published by the University of California, and is illustrated by a map showing the distribution of the mounds. Four hundred and twenty-five separate accumulations are marked on this map, and it is not certain that these represent all the mounds of the region. The mounds have a basal diameter varying from thirty to six hundred feet, and a height varying from a few inches to thirty feet. In addition to shells the mounds contain the bones of birds and mammals, much charcoal with ashes, and a number of broken and charred stones. There are also human remains, showing that the mounds have been used for burial purposes. For the details, which are specially interesting to those acquainted with other similar middens, such as those of Denmark, reference must be made to the original paper. The number and size of the mounds speaks to a large population, due probably to the exceptionally favourable climatic and other conditions.

Australasia.

Geography of New Zealand.—In the January issue of the *Bulletin of the Geographical Society of Philadelphia* there are two interesting articles on New Zealand—one, on the Physical Features, by Dr. J. M. Bell, and the other, on the Commercial Geography, by Mr. P. Marshall. Both are well illustrated, the former especially having a series of very beautiful views of New Zealand, including some fine glacier pictures. Both articles are too detailed to lend themselves readily to a summary, but one or two interesting points may be mentioned, as indicating the nature of their contents.

Dr. Bell points out that though the total area of New Zealand is small (almost exactly half that of France), yet the country shows an extraordinary variety of scenery: volcanic phenomena being well represented in North Island, while in South Island not only do large glaciers now occur, but there is evidence of very extensive past glaciation, which has greatly modified the drainage. The glaciers are of great interest. Franz Joseph glacier, which is some $8\frac{1}{2}$ miles long, and half a mile broad at its widest point, reaches to within some 12 or 13 miles of the sea, although situated in about $43\frac{1}{2}^{\circ}$ S. lat. Its front lies only some 692 feet above sea-level, and to find a similar glacier in Scandinavia it is necessary to travel up to 67° N. lat. Everywhere in the Southern Alps the snow-line is remarkably low, this being due to the enormous precipitation. In the case of the Franz Joseph glacier, the result is that an almost sub-tropical forest occurs close to the ice, inhabited by gaily coloured pigeons and chattering parrots. Even more remarkable is the Douglas glacier, which consists of two parts separated by a precipice 2000 feet in height. Part of this precipice is an ice-fall, but the lower 1000 feet is almost sheer rock, over which avalanches pour with a tremendous noise, to reconstitute the glacier below.

Mr. Marshall points out that New Zealand, in spite of its size, only contains about one million people. Its commercial development has been checked by its isolated position, and by the fact that the markets of the nearest land, Australia, are largely shut off by the high tariffs, Australia producing roughly much the same products as New Zealand, and being anxious to protect her own markets. Asia is also largely useless as an outlet for New Zealand produce, for the staples, wool and meat, are practically not required there. Again, though Europe, and especially Great Britain, takes most of New Zealand's produce, she has to compete in the European markets with Australia, the Argentine, and the Cape, which are all nearer. The pastoral industry is of course the most important, agriculture being less so. The mineral wealth is considerable. England is New Zealand's best customer, and she also buys most manufactured goods from her. Of goods imported from foreign countries, the United States supply half.

Polar.

The Duc d'Orléans' Arctic Expedition.—In *La Géographie* for December 15, some account is given of the last Arctic cruise undertaken

by the Duc d'Orléans, which took place last summer from June to September. Setting out from the Faeroe Islands, the *Belgica* steamed to Jan Mayen, and thence towards the coast of Greenland, where a landing was effected near Cape Hold-with-Hope. After a series of soundings had been made the ocean was crossed to Spitsbergen, thence the voyage was continued to Franz Joseph Land and Nova Zembla, whence the vessel returned to Tromsoe. A very interesting series of soundings was made between Greenland and Spitsbergen, enabling Commandant de Gerlache to complete his bathymetrical chart of this region. A landing was effected at Advent Bay, Spitsbergen, of which region Dr. Recamier gives a somewhat gloomy description. It is, it appears, overrun in summer by English and German tourists, who have exterminated the reindeer, and left heaps of tins and bottles. There is even a shop where picture postcards may be bought! In addition to the tourist traffic the coal is being worked by various companies, and Dr. Recamier prophesies that in a few years Spitsbergen will have become "one large factory." And thus the world grows daily smaller.

The point of special interest as regards the soundings is that, owing to the special conditions of the ice, the *Belgica* was able to carry out a series of soundings along the 78th parallel of North lat. as far as 6° W. of Greenwich, in a region hitherto regarded as inaccessible. The result is to show that in this region the Greenland continental plateau is 160 miles wide, and thus extends much further to the east than was believed. The results confirm those previously obtained as to the effect of the topography of the bottom on the distribution of the ice, the margin of the pack corresponding to the edge of the continental plateau.

General.

The Oceanographical Museum at Monaco.—This Museum was opened during the last week of March in the presence of a distinguished company. The original idea was to erect a museum principally to lodge the Prince of Monaco's own oceanographical collections, but the original conception has been expanded, and it is hoped that ultimately the Museum will contain collections representative of the physics and biology of the ocean in all parts of the globe. The Prince of Monaco himself delivered the inaugural address at the opening of the Museum, and this was followed by congratulatory speeches from the representatives of the various governments present.

The Geography of Food.—M. A. Woeikof contributes to *La Géographie* two articles on this subject which contain some interesting facts. We may recommend the articles as a whole to the notice of teachers, but can only note here certain of the less familiar points. M. Woeikof treats of three types of food, choosing those which he regards as the most important. These are (1) Cereals; (2) Meat; (3) Milk and milk products. Under the first heading he discusses the characters and distribution of the chief temperate and tropical cereals, with copious notes on the methods of use and on the peoples using the different types. In regard to rice he emphasises the difficulties of cultivation, and the

fact that, with few exceptions (notably Georgia in the United States, and North Italy), rice is not produced by agricultural methods in the Western sense, but rather by a system equivalent to our market-gardening. That is, it demands infinite, detailed care, and is not grown in the wholesale fashion in which wheat is grown in the New World. In spite of the laborious methods necessary for its cultivation it persists because it enables otherwise useless marshy ground to be made use of, and because it is very easy of digestion, and so suited to the inhabitants of hot climates.

He next studies the distribution of flesh-eating peoples and notes the occurrence of not a few prosperous non-flesh-eating races or groups, and also the fact that over most of Western Europe the amount of meat eaten has shown a remarkable increase in recent times, parallel with the rise of industries and the consequent increase of wealth. The habit of eating large amounts of meat is also very marked in America, and especially in Australia. Whereas, however, an increase in the demand for a particular cereal, *e.g.* wheat, leads to an increase in the supply and a consequent lowering of price, the price of meat tends to rise with an increased demand. It seems probable that this increase in price will continue as intensive methods of agriculture are more and more practised, and the demand for the land now occupied in pasturing cattle increases, as this land is wanted for agricultural purposes. M. Woeikof believes that this process must continue with the progress of civilisation, so that man must come more and more to depend upon the vegetable kingdom for food. This he regards as an advantage, for he is of opinion that the civilised races are poisoning themselves by an excessive meat diet, which leads to a desire for alcohol. The demand for alcohol again leads to the taking up by plants used for the purpose of producing this, of large stretches of fertile land which might be devoted to plants capable of being used directly for food.

A great difficulty, as every one knows, in regard to the general adoption of vegetarianism in a country is that this necessarily means a rise in price, or ultimate disappearance, of milk and milk products. The author therefore proceeds to study the distribution of these as articles of diet, showing that some races, *e.g.* the Japanese, have been able to dispense with them without loss of efficiency, and that even in Southern Europe they are used to a relatively small extent. They could, he believes, be dispensed with to a much greater extent than is generally believed. He sums up by saying that man must learn to depend more and more upon the vegetable kingdom for his food, and that both in methods of cultivation and in methods of utilisation of vegetable products there is still much to be learned.

The Atlantic Deep-Sea Expedition.—The ss. *Michael Sars*, conveying the members of this expedition (cf. vol. xxv. p. 654), left Plymouth on April 9 for the North Atlantic to begin her exploring cruise.

The Origin of Towns.—In a recent issue of *La Géographie*, M. Étienne Clouzot publishes an interesting paper on this subject. He

discusses some of the more recent work, giving numerous references, and concludes that, as yet, despite the fairly extensive literature of the subject, not enough is known for the drawing of certain conclusions. He calls attention especially to the dearth of good and sufficiently detailed town-plans, notably of towns in their earlier stages of development. His own positive contributions may be summarised as follows:

From the point of view of origin, towns may be classified as natural and artificial. The natural towns have developed slowly, beginning as isolated dwellings, and passing through the stages of hamlet, village, and town. Different from these are the towns which have sprung into being suddenly, and are best exemplified in the New World. In general, the two can be distinguished by the regularity of the artificial town as contrasted with the irregular, as it were, haphazard arrangement of the natural type. Dalny and Alexandria form equally good examples of artificial towns. But it may happen that modern needs lead to a modification of the natural type, which may be so altered as to lose entirely its primitive structure. The driving of regular avenues and boulevards through the irregularities of old Paris is an example. In such cases the distinction between the two types may be obliterated.

The natural causes of the formation of a city were distinguished by Ratzel as two-fold: first, the topographical situation or site, and, second, the geographical position, or relation to the surrounding country or countries. M. Clouzot is, however, of opinion that it is the site which determines the foundation of the city, whereas it is its geographical position which determines its future development. As to the determining conditions of site, there is no doubt that defence was originally important: of this it is not necessary to give examples in Edinburgh. At the same time, a strong position does not apparently greatly favour the future development of a city. It has the advantage over adjacent less well-protected places in times of war, but it is at a disadvantage in times of peace: and as the length of these increase with advancing civilisation, its relative advantage diminishes, or else it tends to overflow the limits of the protected area, if the position be favourable to the development of a great city. Again, we have many Scottish examples. Very interesting in this connection are the variations in size undergone by cities of strategic importance which have lived through more than one civilisation. They have, as it were, ebbed and flowed with the alternation of periods of barbarism and civilisation.

Almost as valuable as the material protection of a strong position is the moral protection associated with a holy city, a great monastery, a church, and so forth. Again, however, the effect is rather in determining the foundation of a city than in promoting its subsequent development. Some such cities persist by becoming centres of pilgrimage, and so on, but as a general rule they tend to diminish unless other conditions are favourable. By far the most important factor in determining the development of a city are the economic conditions—a fact which is, of course, emphasised by all geographers. To what extent political factors are effective in promoting city development, the author confesses himself doubtful. The obvious contrary example is, of course, Washington as

contrasted with New York. But, on the other hand, he is of opinion that the fact that the first members of the house of Capet chose Paris as their residence instead of Orleans has had much to do with the development of the former city. There is also, he believes, a not easily estimated human factor in city development, which makes one group of men overcome natural difficulties which another group would not attempt to struggle against. In sum he considers that, whatever the origin of a city, its development is always subordinated to its geographical position. In an autonomous state it must form a centre; in a state dependent on its neighbours, as are most civilised states, it must be placed upon a great line of communication. "When Egypt sufficed to herself, Thebes was her logical capital; from the day when she entered into continuous relations with the other Mediterranean countries, a capital nearer the sea became necessary to her, and Cairo was born."

Climate and Latitude.—The fact that the relation between climate and latitude is not close is well brought out by a series of figures relating to Trieste, Vienna and Berlin, given in the *Bollettino della Società Geografica Italiana* for January last. The mean temperatures are given in the following table :—

	Berlin.	Vienna.	Trieste.
	°	°	°
Winter, . . .	31·1 F.	31·1 F.	41·4 F.
Spring, . . .	47·6	49·1	54·4
Summer, . . .	64·4	67·1	73·4
Autumn, . . .	49·1	50	58·1
Year, . . .	48·2	49·1	57·2

The most remarkable feature about these figures is that the temperature does not increase regularly in passing southwards. Vienna is 296 miles to the south of Berlin, and yet its mean annual temperature is almost the same. Trieste is only 181 miles south of Vienna, and yet its mean annual temperature is 8° higher than that of Vienna. The difference seems to be due to the effect of the Alps, which protect Trieste from the cold northern winds. The period of least difference between Vienna and Trieste is May, and the period of greatest difference is December. January, which is the coldest month at Trieste, is warmer than March either at Berlin or Vienna.

During the years examined November 4 is the mean date of the first appearance of frost at Berlin, November 1 at Vienna, but January 12 at Trieste. The period between the first and final frost (mean of sixty years) is 160 days at Berlin, 155 days at Vienna, but scarcely 37 days at Trieste. The mean number of days with snow is 34 at Berlin, 32 at Vienna, and 6 at Trieste, but at the last-named place many years pass without snow. When, however, snow does fall at Trieste the fall is heavier than at the two other places, so that there is a mean annual fall there of 42″, as against 22″ at Berlin and 24″ at Vienna. As regards hours of sunshine Trieste is much more favoured than the two other places, especially during the winter months, when there is nearly three times as much sun at Trieste as at Berlin.

EDUCATIONAL.

Mr. G. R. Gill, F.R.G.S., has kindly communicated to us particulars of a new Earth Model, invented by him, and evidently well adapted for assisting in the teaching of geography, the main features of which are indicated in the accompanying illustrations. When not in use the model is placed in a box measuring 5 ft. by 3 by $1\frac{1}{4}$. When the lid of this is opened, there is found first a stand which can be raised and made rigid,

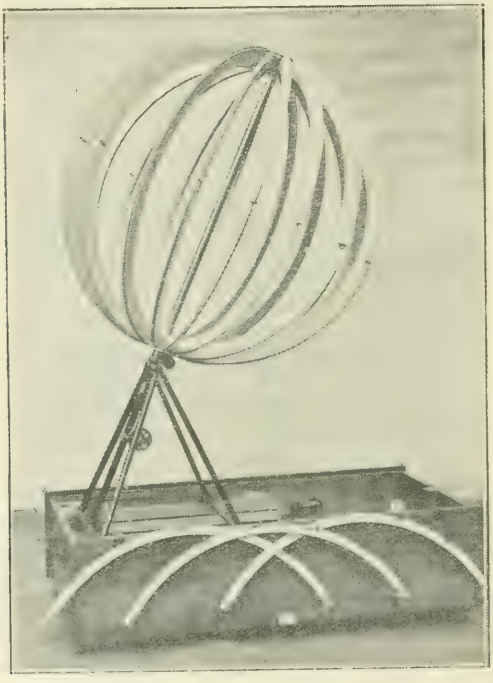


Fig. 1.—The model with the meridians in position. The equator is shown below.

and which bears a steel axis. Eighteen meridians are then fitted to the ends of this axis and stay in place by their own elasticity (Fig. 1), the equator is fitted on, and then the globe is completed by means of thirty-six sections, made of steel faced with papier-maché (Figs. 2 and 3). The slope of the axis can be adjusted to any angle, and that of $23\frac{1}{2}°$ is noted by a bell signal. The globe, which has a diameter of 4 ft. $2\frac{1}{4}$ inches, that is a scale of $1{:}10^6$, can be rotated either with the hand or by means of an electric motor. The surface sections can be made in many different forms, so that the model can be used for different purposes. One exhibits the surface in relief (Fig. 3), the vertical heights being exaggerated twenty times as compared with the horizontal. Other

sections show political features, boundaries, railways, rivers, ocean and cable routes, and so forth, while blank sections are also supplied on which coastlines, etc., can be drawn by the teacher. The different sections are readily interchangeable, and the whole model can be set up in a few minutes. By the use of additional attachments also the model

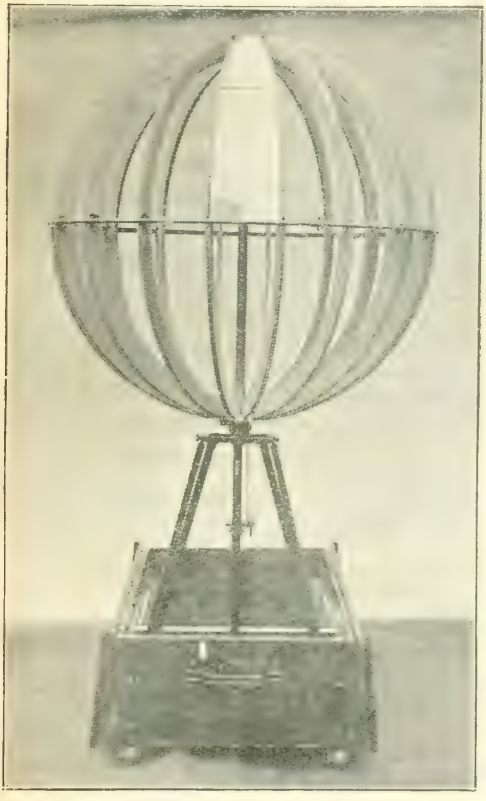


FIG. 2.—The equator and one surface section of Northern Hemisphere in position.

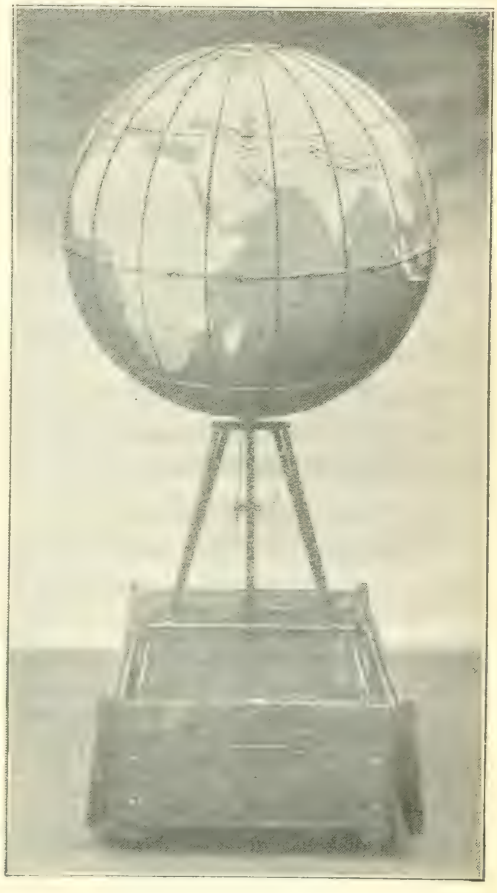


FIG. 3.—The complete model—Physical.

may be used to represent the sun, while smaller models represent the planets. The model may also be used to illustrate the problems connected with the movements of the earth, and is apparently constructed in a very ingenious fashion. It is hoped that it may be possible to arrange to have a demonstration of the actual model in the Society's Rooms in Edinburgh shortly, for the benefit of those interested in educational matters. Meantime, teachers will find in the library some pamphlets on the subject.

NEW BOOKS.

AFRICA.

Egypt and the Egyptians. By the Rev. J. O. Bevan, M.A., F S.A. London: George Allen and Sons, 1909. *Price* 5*s. net.*

The Rev. J. O. Bevan has written many things well, but nothing better than this volume. He deals with the history of Egypt and the Egyptians from the earliest times, and also the habits and customs of the people, with many quaint details of folk-lore and primitive peculiarities. The reader will be enlightened on such subjects as the Coptic religion, of which St. Mark was the first patriarch; the relations with Palestine and adjacent nations during Old and New Testament periods; the rise and spread of Eremitism; the nature of recent finds, stored and catalogued in the Ghizeh Museum at Cairo; the Five Great Uncial Codes, and the history of our alphabet as it has been influenced by the hieroglyphic character, and so on. The author describes the three Egypts: Greater Egypt, Lower Egypt, and Upper Egypt, with a population of nearly ten millions, or 750 to the square mile, and the thirty dynasties of native kings beginning with Mena who founded Memphis and died about 5500 B.C. He tells us of the Gipsies, who originally came from Egypt; of Euclid, a native of Alexandria; of Cairo and its buildings; of Mohammedanism and its founder; of the Suez Canal and its constructor De Lesseps, who pierced the isthmus, through swamps, rock, and sand, and put Egypt on the sea-road to India, Australia, and the Far East.

With Mulai Hafid at Fez: Behind the Scenes in Morocco. By Lawrence Harris, F.R.G.S. London: Smith, Elder, and Co., 1909. *Price* 7*s.* 6*d. net.*

The background and, in great part, the subject of this entertaining book is Morocco, "a country of atrocities which equal the horrors of the Spanish Inquisition," a land of corruption, tyranny, and unscrupulous oppression, whose administration is corrupt, and whose whole population is "in a state of physical decay," and which is, with all that, within two hours of Europe, rich in minerals, with an almost virgin soil, a most delightful climate, and full of beauty and colour.

The author, Mr. Harris, was commissioned by an English journal to interview and sketch Mulai Hafid, the new Sultan, and he successfully carried out his task at no small personal risk.

A brief review like this has no space to recount the many thrilling, and many amusing stories told, and we must refer to the book for the description of Fez, outwardly beautiful, but in an incredibly horrible sanitary state of which "large, fierce, naked rats with pink feet" are but one common item, of the author's dinner party with Raisuli and other Moorish notables, of his hairbreadth escapes from murder and drowning, his flight in the assumed character of a physician, and his further flight from the patients who had swallowed fourfold doses of cascara, of the slave market at Fez, etc., etc.

But the main feature of the book is the description of the new Sultan, with whom the author had several interviews, and whom the author's advice seems to have largely influenced in adopting his final attitude to obtain recognition by the European powers. Mulai Hafid is exhibited as a man of nearly forty years of

age, enjoying robust health, somewhat stout, with a handsome face, the lower part of which is weak and sensual, a high forehead, large almond-shaped eyes, and a hectic flush on his cheeks, but his whole expression marred by a fearful and suspicious look, caused by his constant dread of assassination. In disposition, he is vacillating and incredibly cruel. No doubt in such a country the sovereign's acts are invested with a supernatural character, and excused "by attributing to them a divine inspiration which mere mortals are not capable of apprehending." But Mr. Harris saw him watch a live sheep devoured by a tiger with such a cruel look of enjoyment on his face as he had never before seen on a human face, and he describes in painful detail the execution, in presence of Mulai Hafid sitting in state surrounded by his wazirs, of Mohammed Abdul Lowi, a prominent Sheikh who had been accused of writing treasonable letters to the Sultan's brother.

In the concluding note, the author alludes to the recent settlement of the international questions affecting Morocco, and remarks that the Ministers responsible for the arrangement must have been painfully ignorant of the country they practically ceded to France. He says that the English people have been intentionally kept in ignorance of the riches of Morocco. An eminent engineer, of world-wide experience, who was sent to investigate the northern portion of the country, told him "he would give all Australia and New Zealand for Morocco."

The narrative from beginning to close is bright and interesting.

AMERICA.

The Panama Canal and its Makers. By Vaughan Cornish, D.Sc., F.R.G.S. London: T. Fisher Unwin, 1909. *Price* 5*s. net.*

Books on travel, with concomitant adventures, come in such an unending stream, that in order to justify the publication of a new one the author must have something special to say, together with an attractive method of saying it. Every page of Dr. Vaughan Cornish's excellent book, with its maps and sixty-three photographical illustrations, shows his intimate acquaintance with the construction of the yet little-known Panama Canal, and his keen interest in its project and ultimate success. We regret that in the space at command we can make no attempt to follow the author, who in company with his wife made this absorbingly interesting journey. Dr. Vaughan Cornish in his book states that the Panama Canal will be fifty miles in length, and will probably be completed in 1915, at a cost altogether of £75,000,000. Then the Pacific Coasts of America will be accessible without the necessity of the long voyage to the far South by the Straits of Magellan, thereby shortening the distances by many thousands of miles. The United States have acquired complete ownership and control of the Canal, and of a strip of land five miles wide on either side. The State of Panama is under the protection of the United States.

Christopher Columbus in 1497 discovered the Bay of Limon in the Caribbean Sea, and first sought for a strait which would lead him out on his way to the East Indies. In 1869 the Suez Canal was opened, at a total cost of £24,500,000. Then the Panama Railway route ceased to be the shortest from Europe to the East Indies. In 1881 Mr. Ferdinand de Lesseps inaugurated the "Compagnie Universelle du Canal Inter-Océanique du Panama," made all the easier on account of the facilities offered by the Colon and Panama Railway, constructed by the Americans, and completed in 1855, which this Company bought for £6,000,000. Mr. de Lesseps in the space of eight years excavated in the alluvial soil a large part of the work required for a tide-level canal at a cost of £75,000,000. But this

large expenditure was out of all proportion to the work executed, owing to mal-administration, mismanagement, and defalcations; in 1889 the company went into liquidation. The "New Panama Company" took over the work for a 85-foot high-level canal, which was further planned and adjusted to the requirements of military defence, and is only neutral in a limited sense. The Culebra Cut, of an average depth of 130 feet, and eight miles in length, has been the cause of much delay and expense, being mostly rock in the dividing range separating the Chagres and Rio Grande Rivers. There is no tide on the Atlantic side, but there is an annual rainfall of 140 inches. On the Pacific side the tide rises 20 feet, and there is less rain. The greatest difficulty which beset the engineers was how to control the flood waters of the Chagres River, which occasionally rises 35 feet in a day. This is to be overcome by building a dam of earth (for no solid rock foundation can be obtained) 7700 feet long, 2060 feet broad, and 135 feet high, *i.e.* 50 feet above the surface of the lake which will then be formed, about the size of the Lake of Geneva. This huge earthen dam at Gatun, about seven miles from Colon, will hold up 80 feet of water. The author minutely describes the canal as it is to be, with its three succeeding locks, each with a lift of 32 feet and a uniform depth of 41 feet. There are no storms in the Bay of Panama, but Colon is exposed to the north wind, and provision will have to be made to protect the canal entrance there.

The chapter relating to "Health on the Isthmus" is interesting reading, and shows how the anopheles gnat (or mosquito) which causes malaria, and the stegomyia gnat which causes yellow fever, are now destroyed systematically by pouring heavy oil over all stagnant pools, swamps and drains. The workmen and employees are now immune from the deadly bite of the mosquitoes, for they are all housed in buildings screened with fine-meshed copper gauze. At Culebra the climate is dry and bracing. Labour is plentiful, and wages high. The West Indian negroes are unreliable and unsatisfactory, and the Spanish and Italian are the best workmen, morally as well as physically.

Labrador. By Wilfred T. Grenfell, C.M.G., M.D., and others. New York: The Macmillan Company, 1909. *Price* 10*s. net.*

"Grenfell of Labrador" is now a household word on both sides of the Atlantic. It calls to our minds the distinguished philanthropist who is devoting his many talents and his life to the moral, social, and economic elevation of the inhabitants of Labrador—Europeans, Half-breeds, and Indians, a labour of love, in which he has been conspicuously successful. The volume now before us is thus sure of a hearty welcome both here and in America. It purports to be an account of the country and people of Labrador by Dr. Grenfell, who has associated with himself a number of distinguished scientists, to each of whom has been assigned a subject, with which he is peculiarly competent to deal. Amongst them we notice the name of Dr. A. P. Low, whose delightful *Cruise of the Neptune* was noticed by us in the July number of this Magazine in 1907. But Dr. Grenfell is responsible for the greater part of the work, for which, as he tells us, he has been collecting facts for seventeen years in the leisure moments of a busy and strenuous life. To the great majority of our readers his chapters on the inhabitants of Labrador and on the resources of the country, especially the cod, salmon, herring, and other fisheries, will be the most interesting; but for the scientist there is provided plenty of material for study in the accounts of the physiography, geology, flora, fauna, etc., of this huge region of our empire, which has not hitherto attracted or received

adequate attention. Dr. Grenfell does ample justice to the noble efforts of the Moravian missionaries to educate and raise the status of the people among whom they have cast their lot, but we imagine that it will be a surprise to our readers to learn, on the unimpeachable testimony of Dr. Grenfell, that "the best educated people in the country at present are the Eskimo," while the white population is still very largely illiterate. It is to the moral and social elevation of this unpromising branch of humanity that "Grenfell of Labrador" is devoting himself with a cheerful hopefulness and a catholic charity, which are undaunted by difficulties, however numerous and grave. These difficulties have their origin in the distracted history of the country, its huge extent, its unfavourable climate, the diversity of its inhabitants, the want of inland communications, the poverty and precariousness of the food supply with the exception of fish, the lack of education, the neglect it has received from Government, and other facts for which we refer our readers to this book, which they may peruse with the assurance that they are reading the observations and mature convictions of an authority second to none with regard to the subject in hand. To the geologist, mineralogist, ornithologist, ethnologist and philanthropist, Labrador offers a new and rich field of varied study, while to the sportsman its attractions seem to rival those of the southern regions in the same continent so eloquently described by Mr. Aflalo.

AUSTRALASIA.

Across Papua. By Colonel Kenneth Mackay. London: Witherby and Co., 1909. *Price 7s. 6d. net.*

Colonel Kenneth Mackay was the chairman of a Royal Commission sent out from Australia at the end of 1906 "to inquire into and report upon the present conditions, including the methods of government, of the territory now known as British Guinea, and the best means for their improvement." The present volume does not touch upon the real work of the Commission, but gives an informal and attractive account of the experiences of the members in their wanderings. These wanderings included a journey across the Main Range, and though the height attained was not great, the highest point being 8,690 feet above sea-level, yet the heat, the leeches, and other pests, and the density of the forest rendered the journey a very toilsome one. The descriptions of the people and scenery are of much interest. Of the natives Colonel Mackay speaks well on the whole, in spite of their cannibal propensities, and the horrible cruelty with which their feasts are accompanied. The author gives some account of the agricultural possibilities of the region, but, on the whole, the book is simply a light and interesting account of the unofficial experiences of the members of the Commission. As such it will doubtless find many readers. The book is furnished with a map, some good photographs and an index, and is altogether well got up. The map is adequate, though one could wish for some indication of the hill features.

Life and Labour in Australia. By E. Waltham. London: H. J. Drane, Limited, 1909. *Price 3s. 6d.*

Mr. Waltham draws a favourable picture of the Australian aborigines, fine, stalwart, athletic, full of sinew and muscle, keenly jealous of the honour of their womankind. He also gives a vivid description of a totem dance of which he was a spectator till his unseen presence was detected by the keen scent of the blacks. The author sums up his conclusions on the native question by contrasting the contented

and prosperous state of the sugar plantations with the change caused by the ominous word "Slavery" and by the consequent cry against black labour which caused the tremendous fall in the price of Colonial sugar.

BOOKS RECEIVED.

Northern France from Belgium and the English Channel to the Loire, excluding Paris and its Environs. Handbook for Travellers. By KARL BAEDEKER. Fifth Edition. With 16 Maps and 55 Plans. Crown 8vo. Pp. xxxvi + 454. Leipzig: Karl Baedeker. *Price* 7*s.* 6*d.*

The Queen Newspaper Book of Travel: A Guide to Home and Foreign Resorts. Compiled by the Travel Editor (M. HORNSBY, F.R.G.S.). With Maps and Illustrations (Seventh Year), 1910. Crown 8vo. Pp. viii + 556. London: Horace Cox, 1910. *Price* 2*s.* 6*d. net.*

The True History of the Conquest of New Spain by Bemal Díaz del Castello, one of its Conquerors, from the only exact copy made of the Original Manuscript. Edited and published in Mexico by GENARO GARCIA. Translated into English with Introduction and Notes by ALFRED PERCIVAL MAUDSLAY, M.A. Vol. II. Demy 8vo. Pp. xvi + 343. London: Hakluyt Society, 1910.

A Journal from Japan: a Daily Record of Life as seen by a Scientist. By MARIE C. STOPES, D.Sc., Ph.D., F.R.S. Demy 8vo. Pp. xiv + 280. London: Blackie and Son, Ltd., 1910. *Price* 7*s.* 6*d. net.*

The Home Life of a Golden Eagle. Photographed and Described by H. B. MACPHERSON. With 32 mounted Plates. Second Revised Edition. Crown 4to. Pp. 45. London: Witherby and Co., 1910. *Price* 5*s. net.*

The Melanesians of British New Guinea. By O. G. SELIGMANN, M.D. With a Chapter by F. R. BARTON, C.M.G., and an Appendix by E. L. GIBLIN. Royal 8vo. Pp. xxiii + 766. Cambridge: University Press, 1910. *Price* 21*s. net.*

La République Argentine. Description, Étude Sociale et Histoire. Par H. D. SISSON. Une volume in 16. Pp. 329. Paris: Plon-Nourrit, 1910. *Prix* 3 *fr.* 50.

Cornwall. (*Cambridge County Geographies.*) By S. BARING-GOULD. With Maps, Diagrams, and Illustrations. Crown 8vo. Pp. ix + 164. Cambridge: University Press, 1910. *Price* 1*s.* 6*d. net.*

Southern Germany (*Würtemburg and Bavaria*). Handbook for Travellers. By KARL BAEDEKER. With 36 Maps and 45 Plans. Eleventh Revised Edition. Crown 8vo. Pp. xxx + 364. Leipzig: Karl Baedeker, 1910. *Price* 6*s. net.*

Chez les Jaunes. Japon, Chine, Mandchourie. Avec 16 gravures hors Texte. Crown 8vo. Pp. 299. Paris: Plon-Nourrit et Cie, 1910. *Prix* 4 *fr.*

Mensch und Erde. VON A. KIRCHHOFF (Aus Natur und Geisteswelt). Crown 8vo. Pp. 100. Leipzig: B. G. Teubner, 1910. *Preis* 1.25 *M.*

Corrasion by Gravity Streams, with Application of the Ice-flood Hypothesis. By E. C. ANDREWS, B.A. Sydney, 1909.

Verhandlungen des Siebzehnten Deutschen Geographentages zu Lübeck. Vom 1 bis 6 Juni, 1909. Herausgegeben von GEORG KOLLM. Mit Tafeln und 24 Abbildungen. Demy 8vo. Pp. xcii + 333. Berlin: Dietrich Reimer, 1910. *Preis M.* 12.

Publishers forwarding books for review will greatly oblige by marking the **price** *in clear figures, especially in the case of foreign books.*

THE SCOTTISH

GEOGRAPHICAL

MAGAZINE.

KING EDWARD VII., DIED 6TH MAY 1910.

EXPLORATIONS IN CENTRAL ASIA, 1906-8.

By Dr. M. Aurel Stein.

(With Illustrations.)

(Continued from p. 240.)

An important archæological task made me doubly eager to return to Tun-huang. Already in 1902 my friend, Professor L. de Lóczy, the distinguished head of the Hungarian Geological Survey, had called my attention to the sacred Buddhist grottos known as the "Halls of the Thousand Buddhas" to the SE. of Tun-huang, which as a pioneer of modern geographical exploration in Kansu he had visited as early as 1879. My first flying visit to the sacred caves carved into the precipitous conglomerate cliffs at the mouth of a barren valley some twelve miles to the SE. of the oasis had shown me a wealth of art treasures waiting for closer study. There were hundreds of grottos large and small honeycombing in irregular tiers the sombre rock faces, and almost all of them had on their plastered walls a profusion of beautiful and more or less well-preserved frescoes (Fig. 5). In composition and style they showed closest affinity to the remains of Buddhist pictorial art as transplanted from India. The stucco sculptures in these grottos were equally plentiful, but much of this statuary in friable stucco had evidently suffered both from the hands of iconoclasts and the zeal of pious restorers (Fig. 6).

Plentiful antiquarian evidence proved beyond all doubt that a very great portion of the shrines and art relics belonged to the period of the T'ang dynasty (seventh to ninth century A.D.) when Buddhism had greatly flourished in China. The vicissitudes of the succeeding period had sadly diminished the splendour of the temples and the number of the monks and nuns established near them. Yet in spite of all changes and devastations Tun-huang had evidently managed to retain its traditions

of Buddhist piety down to the time of Marco Polo, and in a fashion even to the present day.

I knew well, therefore, that my archæological activity at the cave temples, as far as frescoes and sculptures were concerned, would by every

Fig. 5.—Buddhist Cave Temples at "The Halls of the Thousand Buddhas."

consideration of prudence have to be strictly platonic. Yet when by May 20th I established myself for a prolonged stay in camp at the sacred site, I confess what kept my heart buoyant were secret hopes of another and more substantial kind. Already, two months before, I had heard vague rumours about a great hidden deposit of ancient MSS. which had been

accidentally discovered by a Taoist monk about two years earlier while restoring one of the temples. The trove was jealously guarded in the walled-up side chapel where it was originally discovered.

The Taoist priest who had come upon and taken charge of it proved a very quaint person, as ignorant of what he was guarding as he was full of fears concerning gods and men. He was at first a difficult person to handle. Our success in the end was, apart from Chiang's tactful diplomacy, due mainly to what the priest was prepared to accept as a special interposition on my behalf of my Chinese patron saint, the great Hsüan-tsang. Already the fact of my well-known attachment to the memory of the saintly traveller had been helpful; for curiously enough

FIG. 6.—Frescoes and Stucco Sculptures in Buddhist Cave Temple at "The Halls of the Thousand Buddhas."

the Tao-shih, though poorly versed in and indifferent to things Buddhist, was quite as ardent an admirer in his own way of "T'ang-sêng," the "great monk of the T'ang period," as I am in another. It is true the fantastic legends which have transformed Hsüan-tsang in popular belief into a sort of saintly Münchhausen, and which accounted for the Tao-shih's worship, are not to be found in the great pilgrim's genuine memoirs. But why should that little difference matter? When the first specimens, which we at last prevailed upon the priest to pick up from the hidden MS. store and show us in secret, proved by mere chance to be fine rolls of paper containing Chinese versions of certain Buddhist texts which the colophons declared to have been brought from India and translated by Hsüan-tsang, the priest and even my zealous secretary were greatly impressed by the portent. Was it not Hsüan-tsang himself, so Chiang

declared, who had at the opportune moment revealed the hiding-place of that MS. hoard in order to prepare for me, his disciple from distant India, a fitting antiquarian reward on the westernmost confines of China proper?

Under the influence of this quasi-divine hint the Tao-shih then summoned up courage to open before me the rough door closing the entrance, which led from the side of the broad front passage of his temple into the rock-carved recess, and which, previous to accidental discovery through a crack, had been hidden behind a frescoed wall. The sight of the small room disclosed was one to make my eyes open wide. Heaped up in layers, but without any order, there appeared in the dim light of the priest's little oil lamp a solid mass of MS. bundles, rising to 10 feet from the floor, and filling, as subsequent measurement showed, close on 500 cubic feet. The thick rolls of paper, about 1 foot high, which turned up first, contained Chinese Buddhist texts in excellent preservation, and yet showing in paper, arrangement, etc., unmistakable signs of great age. Soon I lighted upon an extensive text in a cursive form of Indian Brahmi script, on the reverse of a Chinese roll, and felt relieved of all doubt. Here was indisputable proof that the bulk of the MSS. deposited went back to the time when Indian writing and some knowledge of Sanskrit still prevailed in Central-Asian Buddhism. All the MSS. were manifestly preserved exactly in the same condition they were in when deposited. Nowhere could I trace the slightest effect of moisture.

How grateful I felt for the protection thus afforded when on opening a large packet I found it full of fine paintings on silk and cotton, ex-votos in all kinds of silk and brocade, with a miscellaneous mass of paper pictures, streamers in various fabrics, fragments of embroidered materials, etc. The silk and cotton paintings had served as temple banners, and were found neatly rolled up. When unfurled they displayed beautifully painted figures of Buddhas and Bodhisattwas, either quite Indian in style or else illustrating in a very interesting fashion the adaptation of Indian models to Chinese taste. It was not long before Chiang-ssŭ-yieh had discovered dedicatory legends with dates of the ninth and tenth century A.D. My main care was how many of these delicate, graceful paintings I might hope to rescue from their dismal imprisonment, and the risks attending their present guardian's careless handling. To my surprise and relief he attached little value to these fine art relics of the T'ang times. So I could rapidly put aside "for further inspection" the best of the pictures.

It is impossible for me to describe here how the search was continued day after day without remission, or to indicate all the interesting finds with which this curious digging was rewarded. It was particularly the bundles filled with miscellaneous texts, painted fabrics, papers of all sorts, which yielded in plenty important finds of Buddhist MSS. in Indian and other non-Chinese languages. One of the most important among them was a large and remarkably well-preserved Sanskrit MS. on palm leaves, apparently written earlier than any so far known Sanskrit MS. Tibetan texts both in form of big rolls and Pothis were abundant. Also old Uighur MSS. and block-printed books cropped up in various miscellane-

ous bundles. Kök-turki, too, and even the peculiar form of Syriac script usually employed for Manichæan writings were represented.

Less attractive at first sight, but in reality of particular antiquarian value, were the miscellaneous records in Chinese, such as letters, monastic accounts, etc., which filled these bundles of apparent "waste paper." The plentiful, dated documents found among them soon enabled me to determine that the walling up of the chamber must have taken place very soon after 1000 A.D. There can be little doubt that the fear of some destructive invasion had prompted the act. But the well-sheltered small cave had in all probability served for a long time previously as a place of deposit for far more ancient objects. The partial examination of our Chinese collection, which became possible a year later, disclosed in fact among it quite a series of MSS. showing exact dates which extend certainly as far back as the third century A.D. But it will yet need protracted, scholarly labours before the time of the earliest pieces can be definitely established.

I need not attempt to relate here all the difficulties which had to be overcome in the course of this strange digging, and before the "selections for closer study," as our polite convention styled them, could be secretly transferred to my improvised store-room without any one, even of my own men, having received the slightest inkling. Enough that in the end the worthy Tao-shih became almost ready to recognise that I was performing a pious act in rescuing for Western scholarship these relics of ancient Buddhist literature and art which otherwise were bound to get lost, earlier or later, through local indifference. But my time for feeling true relief came when all the twenty-four cases, heavy with the MS. treasures rescued from that strange place of hiding, and the five more filled with paintings, embroideries, and similar art relics from the same cave, had safely been deposited in London.

The strain of these labours had been great. So by the end of June I felt heartily glad to exchange archæological work in the torrid desert plains for geographical exploration in the western and central Nan-shan. After leaving my collections in the safe keeping of the Ya-mên at An-shi, I moved towards the great snowy range south which forms the water-shed between the Su-lo-ho and the river of Tun-huang. On my way there I discovered a large ruined site near the village of Chiao-tzŭ, between the two lowest of the barren outer ranges. Archæological evidence showed that the walled town must have been occupied up to the twelfth-thirteenth century A.D. All the more striking was the proof which the walls afforded of the effects of wind erosion since that period. In spite of very massive construction all lines of walls facing east have been completely breached through the driving and scouring sand, and in many places practically effaced, while the walls facing N. and S. and thus lying parallel to the direction of the prevailing east winds have escaped practically uninjured. When I subsequently ascended the cañon-like valley in which the stream of Ta-hsi cuts through the second outer range I came upon very picturesque series of Buddhist cave temples, known as *Wang-fu-hsia*, "the Valley of the Ten Thousand Buddhas," and still forming a pilgrimage place. In character and

date they showed close affinity to the "Halls of the Thousand Buddhas."

After surveying the great chain of glacier-crowned peaks which overlook the terribly barren detritus plateaus of the Nan-shan west of the Su-lo-ho, we made our way through a hitherto unexplored mountain tract to the famous Chia-yü-kuan Gate of the still extant Great Wall. Here I succeeded in clearing up an archæological problem of considerable historical interest. It concerns the relation which this wall, hitherto believed to end at Chia-yü-kuan, bears to the ancient defensive border line I had discovered to extend into the desert, over 300 miles further west.

At Su-chou, the first town within the wall, I had to overcome considerable difficulties before we could start by the close of July on our expedition into the central Nan-shan. The local authorities were full of apprehensions about attacks of Tangut robbers, etc., and generally the Chinese settlers of the Kansu oases are swayed by a perfect dread of the mountains, which to them remain a *terra incognita* beyond the outermost range. We could obtain guides only as far as the broad plateau-like valley between the Richthofen and Tolai-shan ranges, where we found gold pits at an elevation of *circ.* 13,000 feet. After leaving these exposed mining-camps, where the snow had just melted, we did not sight human beings until towards the close of the month we came upon a few Mongols grazing in the valleys south of Kan-chou. Fortunately the well-defined character of the four great ranges in which the Nan-shan rises towards the uplands of the Khara-nor and Koko-nor region, made the want of all guidance less serious. The excellent grazing met with almost everywhere at elevations between 11,000 and 13,000 feet was a great boon to our hard-tried animals. But we all suffered a great deal from almost daily downpours of icy rain and sleet, and the trouble arising from the extensive bogs we encountered at the head of the great valleys and even on the broad watershed plateaus. The natural difficulties were increased very considerably by the helplessness of our Chinese pony-men, and what I may politely call their deep-rooted physical aversion from taking risks. Now these dreaded mountains were to them full of risks, imaginary as well as real, and instead of using such intelligence as plentiful opium-smoking had left them to guard against these, they tried their best to run away from them altogether. Again and again they made organised attempts at desertion which threatened to leave us without transport, but luckily could be suppressed without frustrating our plans.

By marches aggregating over 400 miles we managed during August to cross and survey in detail the three northernmost ranges of the Central Nan-shan, all rising to snowy peaks of 18,000 to 19,000 feet, between the longitudes of Su-chou and Kan-chou. In the course of these surveys all rivers descending to the oases as well as to the Su-lo-ho were explored to their glacier-fed sources. The magnificent ice-crowned range which divides the head-waters of the Su-lo-ho from the Khara-nor and Koko-nor drainage proved to rise both in height of individual peaks (probably over 20,000 feet) and of crest line considerably above

the northern ranges. From the wide mountain-girt basin of the Su-lo-ho sources we made our way over bog-covered uplands to the head-waters of the Ta-tung river, where we touched the Pacific drainage. Thence we regained the upper valley of the Kan-chou river and finally effected a passage through the Richthofen range over a succession of high transverse spurs. The total mountain area covered by Ram Singh's plane table Survey, between An-shi and Kan-chou, amounted to close on 24,000 square miles.

From Kan-chou I started early in September on the long journey which was to take me back to the Tarim Basin for my second winter campaign. Several considerations, archæological as well as practical, obliged me to follow on this journey the great caravan route *via* Hami and Turfan, which since the seventh century A.D. has supplanted the more ancient route past Lop-nor. At An-shi, Rai Ram Singh, whose health had proved unequal to the hardships of a second winter's work in the desert, was relieved by Surveyor Rai Lal Singh, who subsequently gave splendid proofs of his exceptional zeal and fitness for surveying work under trying conditions.

Of the long journey commenced early in October 1907 and covering close on 900 miles marching-distance, which took me within about two months from An-shi to Karashahr, I cannot pause to give details here. I devoted some time to visiting important ruined sites, which had been largely explored by the successive expeditions of Professors Grünwedel and Von Lecoq under the auspices of the Prussian Government. On reaching Kara-shahr, early in December, I lost no time in setting the spade to work.

A fair field for systematic excavations was offered by an extensive collection of ruined Buddhist shrines known to the local Mohammedans by the name of Ming-oi, "The Thousand Houses," which dot some low rock terraces jutting out from the foot of the hills one march to the west of Kara-shahr. In spite of all the destruction due to iconoclastic zeal and atmospheric influences, plentiful archæological spoil rewarded our diggings here. The deep débris layers filling the interior of the larger shrines yielded a great quantity of excellent relievo sculptures in stucco, once adorning the temple walls. From vaulted passages enclosing some *cellas* we recovered fine fresco panels which a timely burial had saved both from fire and moisture. Of the lavish adornment with votive gifts which these shrines once enjoyed there survived evidence in finds of painted panels and delicately carved relievos once richly gilt.

During the fortnight spent at Ming-oi we worked under quite Sarmatic conditions. Minimum temperatures down to 42 degrees below freezing-point I should, perhaps, not have minded so much, had we only been saved those icy vapours sent forth by the great Bagrash lake south, which enveloped ruins and camp like a white fog, and did not lift for days. So it was a great relief for us all to move up to the cold but sunny mountains of Khora, where information elicited with much trouble from reticent Mongol shepherds led to the discovery of Buddhist remains hitherto unnoticed.

The New Year of 1908 found us at Korla, where close to the north-

east end of the great sandy desert I felt the satisfaction of having returned once more, as it were, to my own ground.

From there Lal Singh and myself made our way by different routes through unsurveyed desert to the ancient oasis of Kuchar on the great caravan route north-westward. After a rapid survey of the interesting ruins close by, I was free towards the close of January to resume my journey towards the south of the great desert. Inquiries set on foot by me since leaving the Khotan and Keriya region in 1906 had resulted in information reaching me about several ruined sites in the Taklamakan which had remained unexplored, and I was anxious to visit them before the heat and sand-storms of the spring made work on that ground impossible. A march due south from Kuchar, through the Taklamakan to where the Keriya river dies away in the sands, was beset with serious difficulties and possible risks. But Hedin's pioneer journey of 1896 showed that it was practicable under certain conditions, and as there were ruins to be visited near the Keriya river-course I decided to try the "short cut" and thus to save time. I could not disguise to myself the risks to be faced with a relatively large caravan. While Hedin coming from the south had left the end of the Keriya River with the certainty of striking the broad goal of the Tarim right across his route at some point or other, our hope of reaching water within reasonable time depended solely on our steering correctly across some 150 miles of high dunes, towards a particular point, and on the assumption that the Keriya River still actually sent its water there.

On January the 29th we left the last shepherd huts on the Tarim with a party counting altogether twenty men, and food-supplies to last one month and a half. After a trying tramp of eight days over dunes, rising often to 100 feet and more, we reached the northern edge of the dried-up delta which the Keriya River had formed at some ancient period. It presented itself as a perfect maze of dry river-beds all half buried under drift-sand, and often completely disappearing amidst thick jungle of trees and scrub dead since long ages (Fig. 7). Here our real trouble began: it was as if after navigating an open sea we had reached the treacherous marsh coast of a tropical delta without any lighthouses or landmarks to guide us into the right channel. Nowhere on my desert travels have I met ground so confusing and dismal. Attempts to dig wells failed again and again. The hearts of the men, except my brave surveyor Lal Singh, and a few of my old followers, were sinking lower and lower. When five more weary marches had passed without bringing us to water, the increasing alarm of the Shahyar men became a cause of serious concern. Thought of flight was ever tempting them to what was bound to prove destruction. At last on the sixth day the view from a huge sand-ridge of some 300 feet in height revealed in that vast expanse of grey and yellow bleakness a few strange streaks of white. It was the glittering ice-sheet of the river, and the relief was intense when after a long tramp eastwards we arrived at it—and were sure that it was not merely some salt-encrusted marsh-bed. It was time for us all to reach the river. The camels had tasted no water for fully a fortnight. We humans had been rationed for five days on the scanty allowance of about one pint per

diem per man. The ever errant river had formed a new bed at a considerable distance to the west of the one where Hedin had seen it, and the sands through which it now flowed were still absolutely sterile. It took several days more before we arrived at living forest.

After a day's rest I could resume archæological labour at the Kara-dong site, which the river by its latest change has approached again after long centuries. Since my first visit in 1901, the shifting of dunes had laid bare ruined dwellings then too deeply buried beneath the sand. Their excavation now furnished definite antiquarian evidence that a small agricultural settlement had existed here far away in the desert during the first centuries of our era. But neither of the excavations here, nor of

FIG. 7.—Ancient river-bed in dead delta north of Keriya river.

the more fruitful ones carried out in the desert belt north of the Keriya-Khotan route, can I give an account here.

About the middle of April I set out again northward from Khotan by the desert route which leads to Aksu along the Khotan river-bed, then practically dry. While following it I had the satisfaction of discovering on the curious desert hill of Mazar-tagh the ruins of a fort once guarding the route, and of recovering from the huge masses of refuse on the steep rock slopes below a great collection of documents on wood and paper, in a variety of scripts, and none apparently later than the eighth and ninth centuries A.D.

From Aksu I made my way across a barren and yet remarkably picturesque range, previously unsurveyed, to the little-known oasis of Kelpin. Opportunities for historically interesting observations about

progressive desiccation abounded both in this now sadly arid hill region and in extensive débris areas marking ancient settlements, which I subsequently traced in the desert towards the lowest course of the Kashgar River.

But the increasing heat and the thought of the many heavy tasks still before me obliged me to return now by rapid marches to Khotan. Then followed in the shelter of my favourite old garden palace at Khotan six weeks of constant toil, absorbed entirely in the sorting and packing of my archæological collections. Never, perhaps, has the ancient oasis seen such making of cases, tinning, etc., as went on in the courtyards of my old palace during those long, hot weeks.

Before the end of July my energetic surveyor Lal Singh rejoined me from surveys in the Tien-shan, and on August 1st I was able at last to despatch safely my heavy convoy of antiques, making up fifty camel loads, to the foot of the Kara-koram passes, where it was to await me. I myself started with Lal Singh on my long-planned expedition to the sources of the Yurung-kash river. My previous explorations in the Karanghu-tagh region had convinced me that the Yurung-kash headwaters were quite inaccessible from the west. So a fresh effort was now to be made to penetrate into that wholly unexplored mountain region from the east.

The difficulties began early, when we made our way through the terribly confined gorges above Polur to the northernmost high plateau (*circ.* 15,000 feet above the sea) adjoining the outer main Kun-lun range. There we had the good fortune to fall in with a small party of yak hunters from Keriya, one of whom, Pasa, a wily but experienced fellow, could after much trouble be prevailed upon to show us a track to the uppermost Yurung-kash gorge. We reached under his guidance first the deep-cut valley of Zailik. There we found extensive gold pits, evidently worked since long ages. In the old days, when the digging was carried on by forced labour, this terribly rugged gorge with its inclement climate must have seen more human misery than one cared to think of. Forbidding as this valley of Zailik is, its discovery proved to us of great value. We managed to ascend from it a series of high spurs coming straight down from the main Kun-lun range northward, and by establishing survey stations close under its crest-line to map with theodolite, plane table, and photographic panoramas the greater portion of the inexpressibly grand and wild mountain system containing the headwaters of the Yurung-kash. On the south, for a distance of over sixty miles, we could see them flanked by a magnificent range of snowy peaks, some rising to over 23,000 feet, and all clad with glaciers more extensive than any I had so far seen in the Kun-lun.

By crossing a succession of side spurs over passes 17,000 to 18,000 feet high, and subsequently ascending the extremely confined gorge of the main river, we penetrated, after eight trying marches, to the great glacier-bound basin (*circ.* 16,000 feet above the sea; Fig. 8), where the easternmost and largest branch of the river takes its rise. The track we followed was that of wild yaks, and in places impracticable even for our hardy donkeys, unless unladen. The crossing of the glacier-fed side

streams proved often dangerous. Compensation for all these difficulties offered in the excellent survey stations, to which we could climb *en route* at heights from 18,000 to 19,000 feet.

After thus tracing the great river to its ice-bound head, we made our way south over very high plateaus, past the glacier-clad range which feeds the Keriya river sources. Our passage was greatly impeded by frequent snowstorms which swept across the high plateaus and valleys, and soon converted the gentle slopes of detritus into veritable bogs.

Then we surveyed the unexplored ground westwards which in our atlases generally figures as a blank, with the name of "Aksai-chin plain." Instead of a plain we found there high snow-covered spurs descending

FIG. 8.—Glaciers above basin of easternmost Yurung-kash sources.

from the great range which flanks the Yurung-kash sources. A series of elevated lake basins, mainly dry, extending along the foot of these spurs, facilitated our progress. But their increasing barrenness told heavily on our ponies and donkeys, of which, in spite of all care, nearly one-third succumbed in the end. Vegetation, such as it is on these Tibetan uplands, disappeared almost completely after one march from the first lake.

But the most dismal ground was still before us when, after a week of long marches, we reached a large salt lake. Marching round it to the NW., we entered a series of basins, absolutely sterile, and showing in their centre a succession of salt-encrusted, dry lagoons. Deathlike torpor lay over the whole region, no living creature could be sighted, nor even the track of one. It was a great relief when after three depressing marches we struck traces of the old route by which Haji Habibullah,

chief of Khotan at the commencement of the last Mohammedan rebellion, tried to open up direct communication with Ladak and India. We had used up the last of our fodder store when, guided by those traces, we emerged at last on the evening of September 18th in the valley of an eastern feeder of the Kara-kash.

The only task now remaining was to trace Haji Habibullah's route up to the point where it crossed the main Kun-lun range towards Karanghu-tagh, and to fix our position accurately by linking it up with our former surveys from the north side of the main range. So I ascended on September 22nd, with Lal Singh and some Kirghiz, a steep glacier which seemed to offer the nearest approach to the watershed. The ascent, over miles of much-crevassed ice and *névé* deeply covered with fresh snow, taxed us severely, and it was late when at last we had gained the crest at an elevation of about 20,000 feet. Mapping and photographic work delayed our descent in spite of a temperature of 16 degrees below freezing-point at 4 P.M., with the sun shining. No halt was possible *en route* for fear of getting altogether benighted, and when late in the evening camp was reached, I found that the toes of my feet had been severely injured by frost-bite. This was bad luck indeed, but I was glad all the same to know that our exploratory tasks had been carried through to their end.

Realising the serious results of this accident, and the urgency of surgical help, I had myself carried down the Kara-kash valley and across the high Kara-koram passes as rapidly as I could in my improvised litter. But it took me seventeen painfully long marches before I reached Leh, with its small Moravian Mission Station. The operation there performed cost me the toes of my right foot. The wounds left by it healed very slowly. Thus it was not until the end of January that I could reach England, where all my cases with antiques, close on a hundred in number, had just arrived safely.

The return from a long journey like mine cannot mean rest, but only a prelude to labours in some respects even more arduous and important than the work in the field.

The results achieved by my expedition would for the greatest and most valuable part be thrown away if all the exact observations bearing on the physical conditions, past and present; on the ruins unearthed and surveyed; on the antiquities and manuscript remains which have been brought to light by the thousands, were not to be carefully recorded by myself, and made thus available for further researches. To give some idea of the extent of these tasks I may mention that our topographical surveys will, on the scale of four miles to one inch, fill about 100 map-sheets of the standard size, and that the mere unpacking and first arrangement of the thousands of archæological objects could with such assistance as was available not be completed until after the close of the year. The decipherment of the MSS. and individual documents, probably close on 8000 in number, and in about twelve different scripts and languages, will claim the attention of quite a small staff of Orientalist experts, and their labours cannot be started in full earnest until all facts bearing on the origin, date, etc., of the finds as

observed by me on the spot have been thoroughly sifted and published. So with all these tasks and responsibilities before me, I can at present cherish no more eager wish than that my efforts to secure an adequate record of the results may be successful, and that I may thus be able to do to the end what I feel is my duty to science.

THE DEVELOPMENT OF THE INLAND WATERWAYS OF CENTRAL EUROPE.

By H. J. Peddie.

Whatever value and importance this country may attach to its inland waterways, there cannot be any doubt that other nations attach the greatest importance to theirs, and are straining every nerve to bring them into a state of the utmost utility and greatest perfection. Canada, which has already an excellent canal system, is about to spend £20,000,000 sterling on the construction of the Georgian Bay Canal, which will open up the great lakes to ocean-going steamers. The United States of America, which also possess an extensive and valuable system of inland waterways, in addition to the gigantic commitment on the Panama Canal, is contemplating spending £100,000,000 sterling in the formation of another gigantic system, about 5000 miles in circumference, and tapping an area of 1,400,000 square miles—a project which, if fully carried out, will increase the length of the waterways in the Mississippi valley from 16,000 to 45,000 miles. France, which possesses one of the finest systems of waterways in the world (11,000 miles in length), which has cost about £120,000,000 sterling during the last forty years, has also schemes of great magnitude for further extensions.

But it is more particularly to what Germany and Austria are at present engaged upon that I desire to direct special attention. The coasts of Germany are mostly shallow, bleak and inhospitable, devoid of good natural harbours, and with long stretches of dreary sand and mudbanks, and flat, swampy shores, very liable to silting up. This, no doubt, is a protection against the too close approach of a hostile fleet, but it is a decided disadvantage in the case of the mercantile marine, and in the case of their own warships seeking safety from an enemy in their harbours, and in repairing to their docks for refitting. Moreover, the coal and iron districts of Germany lie from 400 to 800 miles inland from the coast. On the other hand, Germany possesses a number of good rivers, which only require to be improved artificially, and linked together, in order to furnish the Fatherland with a magnificent system of inland waterways, of incalculable advantage to the commerce and the manufactures of the Empire. Both the German Government and the nation thoroughly realise the supreme importance and value of their river system as a great national asset, and they have set themselves with great skill, resolutely and systematically, to develop their rivers to their utmost

value, and to unite them into one grand national system of inland waterways, which will link every part of the Fatherland together in a very effective manner.

As is well known, the Kaiser Wilhelm Canal is being enlarged so as to permit of the passage of large warships, at a cost of £12,000,000 sterling. In addition to this, it is intended to connect the mouth of the Elbe by canal with Jade Bay, on which Wilhelmshafen has been constructed, and this project has already been carried out so far as Bremerhafen, and the Canal is to be extended through the neck of land between Bremerhafen and the Jade. When the project is completed the three canals will form a curved inland waterway from Kiel, on the Baltic, to Emden, on the North Sea, of great advantage to the mercantile marine, and invaluable in time of war as a naval base from which to operate either in the North Sea or in the Baltic.

But to come to the proper subject of this paper, the inland river system of Germany: this comprises five great trunk routes, leading from the North Sea and the Baltic right through the country to the southern boundary of the Empire, the general trend of which, notwithstanding various turnings and twistings, is in a south-easterly direction. These are now being converted, at great cost, into one fine system of first-class waterways, and they are also being linked together, from west to east, by a cross-country system of waterways running from the Ems, on the extreme west, to the Vistula and the Dnieper on the extreme east, roughly parallel with the northern coast-line. It will thus be seen that the country is being covered with a network of admirably planned and skilfully executed inland waterways, partly natural and partly artificial.

Let us examine the various routes in detail, beginning with the most westerly, the Rhine route, which runs from the North Sea to Switzerland, and with its tributary, the Main, also reaches Bavaria. The Rhine, however, debouches into the North Sea through Holland, and Germany has resolved to secure an entirely independent access to the North Sea through her own territory. She has therefore improved and canalised the river Ems from Emden on the coast to Dortmund, and there connected the Ems with the Rhine by the Rhine-Ems Canal. This route is being made of a uniform depth with the Rhine, so that barges of even 3000 tons can pass over it. Germany thus possesses an outlet from the Rhine to the North Sea entirely within her own territory. Dortmund is being provided with harbour works of greater extent than those of Hamburg, and Emden is being provided with the most modern and up-to-date appliances for the efficient and economical handling of traffic.

Frankfurt-on-the-Main is spending from £2,500,000 to £3,000,000 sterling on modern and up-to-date docks, and above Frankfurt the river is being deepened as far as Aschaffenberg, and canals are to be made to link up at Bamberg and Nürnberg with the Ludwig Canal, which connects with the Danube. Mannheim, 160 miles higher up the Rhine than Cologne, has constructed a first-class set of docks and quays, and contemplates a further extension of these.

Then Switzerland has resolved to develop a maritime commerce from

Basel *via* the Rhine and Holland, and it was intimated last year that a steamer was to run between Basel and London. Not content with this, they have a project to link the North Sea with the Mediterranean, the details of which I am not at present in a position to furnish. When the Ems-Rhine-Main route is completed, Germany will possess a great national inland water highway, traversing a rich, populous, manufacturing, mining, and commercial district, and reaching from the North Sea to the highlands of Switzerland on the one hand, and through the Danube to the Black Sea on the other hand, whilst it is probable that, ultimately, it may reach the Mediterranean through the Swiss rivers and their connections.

The second route to be noticed is that of the Weser, with its great port of Bremen, which city has plans for a new town, a canal and docks, and a great industrial centre, to be carried out at vast expense. The Weser is navigable as far as Münden, and its tributary the Fulda has been canalised as far as Cassel. About half-way between Emden and Dortmund a canal runs at right angles connecting the Weser with the Ems-Rhine route, and it is also to be connected, as will hereafter be described, with the other three more easterly trunk routes.

Passing still farther east, we reach the Elbe, 75 miles from the mouth of which stands Hamburg, the first sea-port of Germany, and by far the most important port in Continental Europe. The Elbe, which discharges into the North Sea, and also connects with the Baltic Sea by the river Trave, penetrates to Austria, and connects with the Danube above Dresden. Within the Austrian territory it is to be canalised so as to afford easy access to Saxony, the Rhenish districts, and the North Sea. The up-and-down river traffic on the Elbe, between the Bohemian frontier and the sea, is given at considerably over 23,000,000 tons annually. The great value to Germany of this inland waterway will be easily realised. But further, last year a plan was sanctioned by Schleswig-Holstein for a canal from the Elbe to Kiel.

Going still farther east, we reach the Oder, on which lie the three important cities of Stettin, Frankfurt, and Breslau. This river, which reaches from the Baltic to Austrian territory, is to be canalised at the cost of £1,000,000 sterling from south of Frankfurt, particularly above Kosel in Silesia, to Oderberg on the Austrian frontier. Then from Oderberg a most important waterway connection, more generally known as the Danube-Oder Canal, but which the Austrians prefer to designate the Black Sea-Baltic Canal, is being made in order to link up the Oder and the Danube, the Elbe, the Vistula, and the Dnieper rivers, and is designed to give passage to ships up to 600 tons burthen. This important project, which was sanctioned in 1901, and which is to be completed before 1924 at an estimated cost of £34,400,000 sterling, consists of six canals, with a total length, in the complete system, of 1600 kilometres. The Danube-Oder scheme proper is an old one, and is a rival scheme to the Russian project, originated some fifty years ago, for linking up the Baltic and the Black Sea by connecting the Dwina from the Gulf of Riga with the Dnieper, which flows into the Black Sea near Kherson.

In 1702 Leopold I. of Austria ordered the improvement of the river March, which flows south through Moravia, near the German frontier, and falls into the Danube not far from Pressburg. Some seventeen years later plans were made for connecting the river Becza, a small tributary of the March, with the Luhabach, a small tributary of the upper Oder, and this is virtually the scheme presently being carried out. At various times different schemes have been brought forward to effect the necessary junction, such as the 1873 project for a canal with five locks, a French scheme for seven ship railways, another scheme for a lockless canal, and one for a ship railway, but all came to nothing.

Near the Moravian town of Weisskirchen the Becza and the Luhabach approach within 19½ kilometres of each other with a dividing watershed of 43 metres in height. According to the scheme begun in 1908, and now being steadily pushed forward, the watershed is to be pierced with a tunnel, and a canal formed from the Oder *via* the Luhabach, the tunnel, the Becza, and the March, to the Danube. When completed this will give a through inland waterway, 2700 kilometres in length, between the Black Sea and the Baltic, giving passage, as above stated, to vessels up to 600 tons burthen. Vienna will then become a somewhat important inland port, having water communication with the North Sea, the Baltic, and the Black Sea, with various parts of the German Empire, with Western Russia and the Balkan States, as well as with Austrian territory proper. The cost of the Danube-Oder Canal is estimated at £12,000,000 sterling, and as the traffic at first is only estimated at from 60,000, to 70,000 tons per annum, the importance which Austria attaches to the project can readily be gauged. She anticipates from it a large import of Silesian coal to be used in preference to her own brown Bohemian coal, and also a growing traffic in timber, grain, and sugar, reaching to the very heart of her own territories. She will also be able successfully to compete with German manufacturers on their own ground in a considerable portion of Germany. Strategic advantages, as will be pointed out hereafter, also weigh with her. It will be interesting to see the result of the construction of the ship-canal tunnel, which may have an important bearing on other similar canals.

Again, the Oder is connected with the Havel and the Spree by the Friedrich Wilhelm Canal, and at a cost of over two millions sterling a canal, of sufficient size for large vessels, is being made from Stettin to Berlin, which will convert the latter city into a first-class inland port, with a waterway connection very similar to that which its rival Vienna will also possess when the various projects contemplated are completed.

Finally, we reach the fifth trunk route, the Vistula, reaching from the Baltic through Prussia and Poland to Austria, and having lying on it the three large and important cities of Dantzic, Warsaw, and Cracow. As has just been stated, the Vistula is to be linked up on the west with the Oder and the Danube, by the Danube-Oder Canal, from which a connection with the Elbe can easily be effected, and on the east with the Dnieper river, thus getting direct access to the Black Sea and Odessa.

Let us now look at the cross-country connection being formed between the above five trunk routes, beginning again at the western end. As

before stated, the Rhine has been connected with the Ems by the Rhine-Ems Canal. Then half-way between Emden and Dortmund the Ems is connected by a canal with the Weser, and this canal is to be carried, *via* Hanover and Berlin, to meet the Oder near Frankfurt. A connection, costing one million, is being carried out between the Oder and the Vistula, and from the Warthe to Posen, and, as before said, the Vistula is to connect with the Dnieper.

The cost of all these great undertakings I have not been able to ascertain, but from the information available it may safely be taken as not under sixty to seventy millions sterling, and most probably a great deal more. Many of the canals, etc., will never yield any return in the shape of interest on the capital sunk in them: but the enormous benefit that will accrue from them to the commerce and manufactures and the agriculture of the countries can hardly be overestimated. The two empires will be penetrated by them from the sea to their most inland districts. The great industrial centres will have cheap and easy access both to the coasts and to the various parts of the two empires and the adjoining countries with which the empires have thus been linked. Berlin and Vienna and other large cities will become considerable inland ports, with excellent waterways to both the northern and the southern seas, and to the most inland districts of the two countries. The various routes which have been described will in course of time be linked with the inland waterways of Belgium, France, and other parts of Russia, and it is impossible to forecast the resulting development of the commerce which will thus be created between the various countries.

But these waterways are also destined to play an important part in the national defences of Germany. The advantages of the Kaiser Wilhelm Canal and its extensions to the Jade, have already been referred to. Then as regards the inland waterways, if Germany was at war with a great naval power, even if her fleets were destroyed and her flag disappeared from the high seas, she could still with perfect safety and ease carry on through her inland waterways a very great commerce with Denmark, Holland, Switzerland, Austria, and Poland, and when the necessary connections are made, with Belgium, France, and Russia, in addition to that on her railways and roadways.

Numerous dry docks and slips are also being built in Germany in connection with the waterways, which will therefore play no small part in the national defences of the Fatherland.

In closing, it may not be out of place to call attention here to the important fact, that in Austria and other Continental countries the question of the international consumption of water and the State control and allocation of the national water resources, is being dealt with, as it will soon require to be dealt with in Britain. How important this matter is may be gathered from the following facts. From an investigation by "the National Conservation Commission" of the United States of America, it appears that 215 trillion cubic feet of rain falls in the States annually, of which rather more than one-half is evaporated, about one-third flows in rivers to the sea, the remainder being either used or absorbed in plant growth or other chemical action, or permeating

deeper, and reaching the sea subterraneously. Benefit accrues from what is evaporated, but of the third which flows to the sea less than one per cent. is utilised by the community. In arid regions about 10 per cent. is used for irrigation purposes, and it is estimated that 5 per cent. is used for navigation and 5 per cent. for power, the water used for navigation and for power being in many cases the same. More than 85 per cent. of the surface water flows unused to the sea. The waste and loss to the country, from this state of matters, is obvious. It would be interesting and instructive to learn how the matter stands in the United Kingdom.

THE DISTRIBUTION OF THE TOWNS AND VILLAGES OF SCOTLAND.

By James Cossar, M.A.

(*Continued from page* 191.)

2. Historical Aspects of the Question.

In his papers dealing with the distribution of the towns and villages of England, Mr. Chisholm has pointed out that the origin of several of the present centres of population can be traced to Roman times. The Roman conquest of the country lying to the north of the Tweed was clearly of a much less permanent nature, for no Scottish town or village can with absolute certainty be said to have taken its rise as a Roman settlement. It has been possible to trace the course of one or two roads which were probably made by the early invaders; and the position of Antonine's wall shows that they fully appreciated the valuable line of defence afforded by the geographical conditions of this part of the country. Roman remains have been unearthed at Birrens, in Dumfriesshire, at Newstead, near Melrose, at Ardoch and Inchtuthill in Perthshire, some of which seem to mark the site of ancient military settlements. Inveresk may have been a Roman station, and the bridge at Musselburgh is generally credited with a Roman origin. Cramond and Dumbarton are supposed to occupy the sites of Roman seaports, while another may have existed on Carron Water near the present Camelon. But with the scanty material at our disposal it is not yet possible to determine either the extent of the Roman invasion or its effect upon the development of the peoples north of the Tweed, and the entire absence of Roman place-names in the country would seem to indicate that the influence of their occupation was less enduring and pervasive than in the southern part of the kingdom. Nor can it be said that we have much more definite information about the condition and distribution of the population for several centuries after the final withdrawal of the Roman forces. The attempt to locate the scenes of the Arthurian romance in our own country is interesting, but scarcely of importance for our present purpose.

We know with greater certainty that Dumbarton had become the capital of the Brythonic Celts early in the sixth century, while the Scots who crossed over from Ireland selected Dunadd, in Argyllshire, as their chief seat. Two centuries later, probably on account of its central position in relation to the two divisions of the people, Scone had become the administrative centre of the Picts. The frequent incursions of the northern peoples into the territory of Lothian made a fortified position on the southern side of the Forth of the utmost importance, and long before the ninth century a community had settled on the eastern slope of the fortified rock round which the future metropolis of the country was to take its rise. Dunbar, also, seems to have played an important part in the history of these early centuries on account of its defensive situation, and it was one of the strongholds against which Kenneth MacAlpin directed his attack when he invaded Lothian in the middle of the ninth century. In the reign of Constantin I., Dunkeld had been chosen as the ecclesiastical capital of the country, and Dunblane was also an important religious centre about the same period. It is not unlikely that a monastery was established at St. Andrews in the course of the same century.

Dunfermline, which could easily be reached from the southern part of the country by the narrow passage over the Forth at Queensferry, but which at the same time occupied a very strong position against any possible attack, became the capital of the country in Malcolm Canmore's reign; and although his son, Edgar, seems to have made Edinburgh his headquarters, Dunfermline continued for many years to enjoy considerable importance as a royal residence. From a charter belonging to the first quarter of the twelfth century it appears that the leading towns of the country at that time were Edinburgh, Stirling, Inverkeithing, Perth, and Aberdeen. Of all the places already referred to, however, little can be said except that they seem to have taken their rise either as places of defence or as religious centres, which not infrequently were planted in positions capable of being easily fortified. It was not until the various and diverse elements that went to the making of the Scottish nation were firmly welded together, and not indeed for many years after Scotland had extended her boundaries to the Tweed and the Solway, not until more peaceful conditions and the greater security of property were established by means of settled government, that the steady growth of centres of population became possible. Thus it is not till the epoch-making reign of David I. that we find the most convenient starting-point for our present inquiry. "Of all the reigns of Scottish kings," writes Professor Hume Brown, "that of David is undoubtedly the most memorable in every aspect of the life of the people. In its radical breach with the past it had its only parallel in the sixteenth century when a new religion changed the destinies of the nation. But in the extent of its civic, political, and ecclesiastical changes it surpasses in importance the religious revolution which gave the country to Protestantism."

Not only did the internal conditions of the country at this time favour the development of thriving communities, the affairs of foreign

nations also contributed to the commercial expansion of the country, for while England was divided by the fierce struggle of the rival claimants to her throne, and while the King of the French was fighting to preserve his crown against nobles as powerful as himself, Scotland "enjoyed a peace and prosperity which made her the refuge for exiles and a mart for foreign commerce." Two facts of David's reign have an important bearing upon the present discussion. The first is his policy of completing the subjugation of his kingdom and maintaining it in peace by establishing plantations of foreigners, men of Norman, Saxon, or Danish origin, in different parts of the country; and while Norman place-names are few in number it cannot be doubted that many of our towns and villages first took their rise under the shadow of the baronial castle.

No less important was David's attitude towards the Church. For several centuries before this time the Church had exerted a most beneficent influence in harmonising the heterogeneous elements within the country. Moreover, the early Columban monastery was little more than a small village in which the chief occupation of the inhabitants was the performance of religious rites, and some of these centres no doubt formed the nuclei round which modern towns have developed. In the ecclesiastical body of his time David found an ally by whose aid he hoped to complete the process of consolidating his kingdom and of establishing order and good government throughout his dominions. Accordingly, in the words of the old chronicler,

"he illumynyd in his dayis
His landys with kyrkys and with abbayis."

When he ascended the throne St. Andrews, Glasgow, Dunkeld, and Moray were the only bishoprics in existence, but during his reign he created the sees of Ross, Aberdeen, Caithness, Dunblane, and Brechin. Still more striking and significant is the number of abbeys that owe their foundation to his munificence. Kelso, Dryburgh, Melrose, Jedburgh, Newbattle, Dundrennan, Cambuskenneth, Holyrood, and Kynloss all date from this time, although it is possible that in some cases a religious edifice had previously existed in the vicinity. Now, while these facts may seem but commonplace events of ecclesiastical history, they are of the utmost importance from our point of view, for it was under the care of the monasteries that many industries were first established, and the promotion of industry and the encouragement of agriculture were inevitably followed by the development of towns and villages.

It is noticeable that with the exception of Kynloss, near the mouth of the Findhorn, the abbeys founded by David are situated in the southern part of the kingdom, while four are to be found in the valley of the Tweed. At this period the basin of the Tweed seems to have been the most important and the most prosperous part of the whole kingdom. Although the area often suffered by the inroads of the "auld enemy," it was also the first region to reap the benefit of the many civilising influences that flowed from the southern part of the island. The steady development of the pastoral and agricultural resources of the valley gave rise to many little communities along the banks of the Tweed, especially

at those points of its course where a passage could be easily effected. In the middle of the twelfth century a Cistercian priory had been erected at the lowest crossing point of the Tweed of any importance, near which Coldstream took its rise. A few miles farther up the stream could again be forded, and here arose the village of Birgham, which, though now quite an insignificant place, was of sufficient importance towards the end of the twelfth century to be chosen as the meeting-place of the King of Scotland with a royal envoy from the English court, and also of the Convention of Estates a century later. Kelso grew up at another crossing point of the Tweed, and was eventually to surpass and supersede the royal and ancient Roxburgh. Melrose Abbey was established at a place called Fordel, the name of which sufficiently indicates at least one important advantage which made it a suitable site for a great religious house. Peebles, on the right bank of Eddleston Water, where it joins the main stream, possessed a mill and a brewery in the twelfth century, and seems to have been a centre of considerable activity even in those early days. Traquair, though now a very small hamlet, was also a place of great importance about this time. With the rise of so many communities throughout the Tweed valley Berwick became an important seaport and early established trade relations with the countries lying beyond the North Sea. Indeed, if we are to credit the story told by Torfaeus of the merchant of Berwick who was able to command the services of no fewer than fourteen ships to take part in the pursuit of the pirate jarl who had captured one of his vessels, Berwick must have been the home of several merchant princes long before King David's reign. Of the subsequent prosperity and importance of the town at the mouth of the Tweed there can be no doubt, and for a long period it remained the leading commercial centre of the country. Easily accessible from the Continent, it seems to have become the headquarters of a number of merchants and tradesmen from the Low Countries who did much to further its development. When St. Andrews became a royal burgh it was a Flemish merchant, resident in Berwick, who was chosen by the king to be its first provost.

In addition to assigning grants of land to Norman vassals at whose gates dependent communities gradually arose, and besides founding religious houses in different parts of the kingdom, David did much to further the interests of the towns already in existence. From a reference in a charter granted by William the Lyon to Aberdeen it appears that even before David ascended the throne a federation of several of the towns north of the Grampians had already been established. In the southern part of the kingdom Roxburgh, Berwick, Edinburgh, and Stirling were created royal burghs previous to his accession. But by the security to life and property which his firm government assured, and by the direct encouragement he gave to commerce, David did more than any of his predecessors and than some of his successors to develop the natural resources of the country, and to promote the rise of trading communities. In the following reign charters were granted to Rutherglen, Aberdeen, Perth, Inverness, and Ayr. At a later date Lanark and Linlithgow took the place of Roxburgh and Berwick, which were probably too liable to have their prosperity interrupted by the attentions of

southern invaders. These royal burghs played an important part in the development of the country during several centuries, and enjoyed, among other privileges, the monopoly of the trade within a wide area (in the case of Edinburgh, for example, the monopoly extended over the area stretching from Edgebucklin Brae on the east to the river Almond on the west), and freedom from most of the duties imposed on the internal trade of the country.

The charters of William's reign show that at various times he resided at Selkirk, Melrose, Traquair, Roxburgh, Lanark, Rutherglen, Stirling, Linlithgow, Clackmannan, Edinburgh, Haddington, Dunfermline, St. Andrews, Kinghorn, Forfar, Aberdeen, Elgin, Forres, Nairn, and Inverness. It seems a reasonable inference that these places were centres of some importance as early as the end of the twelfth century. Certainly most of them were visited by Edward I. when he made his famous itinerary of Scotland towards the end of the following century, and yet having travelled no farther westwards than Stirling, the invader considered that he had "conquerid and serchid the kingdom of Scotland." Although there were several important centres in the west of Scotland, for example, Dumbarton, Glasgow, and the royal burgh of Ayr, it was the eastern half of the kingdom that had made, and for some centuries continued to make, the greatest advance, and there the great part of the population was concentrated. This part of the country contained a larger number of fertile tracts, it was less mountainous, it had a larger number of useful waterways leading to the interior, it possessed a greater number of seaports, and, most important of all, it was nearer the continent of Europe than the western side of the kingdom. The proximity of the eastern seaboard to the Continental markets, and the readiness with which foreign influences could penetrate this part of the country, are the dominating factors in the commercial expansion of the region, and of the development of the towns. Reference has already been made to the presence of Flemish merchants in Berwick; in the opening years of the twelfth century the merchants of Perth had been enterprising enough to establish a Baltic trade. The predominance of the towns on the eastern side of the country is borne out by an examination of the amounts paid to the Chamberlain by the different communities in 1369. Edinburgh had by this time become the leading burgh in the country, while the others in order were Linlithgow, Aberdeen, Haddington, Dundee, Perth, Montrose, St. Andrews, Dunbar, Stirling, Elgin, Inverness, and Ayr.

Although the fifteenth century was in many ways a troubled period in the history of Scotland, yet the struggles of rival lords and the raids of Border reavers, the events of "the Black Dinner," and the rise and fall of kings were not sufficient to prevent national development. The creation of a vernacular literature, unrivalled perhaps even by that of Italy, the rise of the universities, the attempt to restrict the expenditure of different sections of the community on articles of dress, and the foundation of a naval as well as of a mercantile marine, all serve in different ways to indicate the increasing material prosperity of the nation.

It is evident from Hardyng's chronicle that some attention was being

paid to the communications of the country, and a considerable part of the bog that existed in the vicinity of Bannockburn in 1314 had been drained some time before the chronicler visited Scotland in the second quarter of the fifteenth century; at the latter date the district between Monteith and Falkirk was without moss or mire, and a "fayre ready waye" stretched as far as Dysart. Dundee had now become "the pryncypall burgh by northe the Scotysche see," while Aberdeen is described by Hardyng as

> "a goodly citee,
> A merchaunt toune and universytee."

The western and south-western part of the kingdom seems also to have been in a flourishing condition at this time, and the chronicler's remarks about the fertility of the country and its capacity for supplying the needs of an invading army are in striking contrast to those made by Froissart in the preceding century. The general prosperity and progress of the kingdom at this time, and especially during the reign of James IV., is also referred to by Pedro de Ayala, who rightly attributes much of the national development and the prosperous condition of the towns to the presence of foreigners in the country. It is certain that a better understanding with the countries of the Continent had led to a considerable expansion of the foreign trade of Scotland, and so important did her commercial interests on the Continent become, that it was found expedient to appoint a "conservator of the privileges of the Scotch nation" in Flanders. Again, it was the seaports on the eastern seaboard that gained most from the expansion of the foreign trade, and the loyal citizens of Aberdeen had found the Continental trade such a lucrative one, that in 1475 they were able to defray the cost of fitting out three ships for the service of their king. With the growth of foreign trade and the creation of a navy, shipbuilding became an important industry at many of the ports. Aberdeen, Inverness, and several places along the Fife coast, at all of which plentiful supplies of timber could be furnished by the neighbouring forests, acquired considerable importance in connection with this industry. In the opening years of the sixteenth century "ane verie monstrous great schip called the Michael" was launched at Newhaven, where a royal dockyard had been established.

Contemporary documents furnish abundant evidence that during the sixteenth century almost every part of Scotland enjoyed great prosperity, and that the resources of the country were being steadily developed. Major, Boece, Leslie, Munro, and George Buchanan all testify to the progress being made throughout the country in their day. The western part of the kingdom was still far behind the more favourably placed east in importance, but even at this date the growing commerce of the region was seeking an outlet by the nearest ports. At Ayr, says one traveller, "strange natiouns oft arryves and their landes, the port is sa commodious," and George Buchanan remarks that the comparative poverty of the soil in this district tended to encourage the industrial activities of the inhabitants who were chiefly dependent for their means of livelihood upon their own labours. The banks of the Irvine and the

Stinchar were already skirted with pleasant villages, for the great fertility of this district and the abundance of fish produced along the coast enabled the various communities not only to supply their own needs but also the wants of their neighbours. Lanark and Glasgow were the leading centres of population in Clydesdale at this time, and Paisley was also of some importance, although its increasing prosperity was not very favourably regarded by the neighbouring burgh of Renfrew. In addition to many thriving fishing villages on the Clyde, Govan was, in Bishop Leslie's time, "a gret and ane large village," which had become known throughout the whole land for its manufacture of ale.

During this century the presence of several minerals in the country was recognised, although it was not till two centuries later that their extent and importance were fully realised. Even at this time, however, lead ore formed an item in the export trade of the country, and according to Boece there were lead and iron mines in Lochaber and Argyllshire. Gold was also sought for at Meggetland in Peeblesshire, Crawford Muir, and in the vicinity of Wanlockhead; while in Fife, says the traveller just referred to, "ar won black stanis, quhilk hes sa intollerable heit, quhen they ar kendillit, that they resolve and meltis irne, and ar thairfore richt profittable for operation of smithis."

More significant than any mining that was carried on during this period was the gradual development of manufacturing centres. In the beginning of the sixteenth century Dundee contained "mony virtewus and lauborius pepill" who carried on the manufacture of cloth. The weavers of Glasgow followed the example of the Edinburgh craftsmen and became incorporated in 1527. Bishop Leslie describes Dumfries as "a toune nather base nor of simple digrie," and famous for its manufacture of fine cloth, which even half a century before this was greatly sought after by "the merchandis of uncouth realmes." Woollen manufactures were actively carried on at Tillicoultry in the reign of Queen Mary, and before the death of James VI. the linen industry had taken root in different parts of the kingdom. Much of the industrial advance made by the nation in this century is to be ascribed to foreign influence, and the foreign policy of the period was of the utmost importance from the commercial as well as the political point of view. Not only were several legislative efforts made to expand the foreign trade of the country, but direct encouragement was given to foreign craftsmen to settle within its borders and instruct the natives in the arts of manufacture. In 1588 the Town Council of Edinburgh devoted a sum of £68, 6s. 8d. for the purpose of importing a number of Flemish weavers, dyers, and fullers into the city; in the opening years of the following century several foreigners were carrying on the manufacture of woollen cloth in the capital.

It is practically impossible to obtain any details as to the size of the towns in the sixteenth century. All the places of the kingdom were small, according to Estienne Perlin, who visited the country in 1551, and even a hundred years later the burgh towns were the only places in the country deserving any other appellation than that of village. But of the pre-eminence of Edinburgh at this period there can be no doubt. Its population probably did not exceed 30,000 inhabitants, yet, says

Henri, Duc de Rohan, who travelled in Scotland in the closing years of the century, "the buildings are so stocked with inmates that there can hardly be another town so populous for its size. It is by far the busiest commercial town in the country. Indeed it would be against all reason were not this the case. For, in the first place, it is situated in the most fertile district of Scotland, as is proved by the fact that more than a hundred country seats are to be found within a radius of two leagues of the town, it being the ordinary residence of the Court. The second and better reason is that one of the best harbours in all Scotland is within less than half a league." The importance of the capital had been still further added to during the reign of James V., when, partly because it was already the chief royal residence and the military headquarters of the country, but partly also because of its central situation in the most populous part of the kingdom, it became the permanent seat of the civil authority. The political events of the century greatly increased the importance of Leith; it formed the most convenient landing-place for the armies that came to the help of one or other of the contending parties in the country, and its population seems to have increased rapidly during this period, for "when Monsieur Dessy, a Frenchman, did fortifie Lethe for the strength of Edenborow, it began of a bare village to grow to a toune." So important had Leith become by the middle of the century that it was the intention of the Queen Regent to make the town a royal burgh, but, perhaps fortunately for the capital, the proposal was never carried out.

From a consideration of the sums contributed to the national expenditure by the individual burghs in the middle of the sixteenth century some idea may be obtained of their relative importance. Edinburgh, of course, occupies the first place with a contribution of £2250; Dundee is evidently the second town in the country at this time (and the attention paid to it by General Monk a century later would seem to bear out the great importance of the place); its share of the national burdens amounted to £1265. The other towns in order were Aberdeen, Perth, St. Andrews, Cupar-Fife, Montrose, Stirling, Ayr, Glasgow (with a contribution of £202), Dumfries, Inverness, Linlithgow and Haddington. By their favourable position in relation to the markets of the Continent the towns on or within easy reach of the eastern seaboard still far outstripped in importance any of the centres of population on the other side of the country. From the statement of Fynes Morison it appears that the foreign trade of the country was chiefly carried on at four places—at Camphire in Zetland, at Bordeaux in France, at several ports on the Baltic Sea, and in England. Before the close of the century the goods of the Scottish weavers were beginning to take a more prominent place in the export trade, and according to a document recently discovered in the chest of the Earl of Mar and Kellie, between the years 1611-1614 the exports of "commadities maid and wrocht in the countrie" amounted to £169,000 annually, consisting mainly of "claythe and plading," "lynning yairne," "lynning claythe," "prick hoise," and "gluiffis" (for the manufacture of which Perth seems to have been the most important seat). A considerable entrepôt trade appears to have been established

even at this early date, and during the years to which the document refers the foreign goods re-exported formed about five per cent. of the total export trade. But the most important items in the foreign trade were skins and fish; the exports of the latter commodity, during the three years 1611-1614, being of the annual value of £153,354. In the course of the seventeenth century Dunbar became the most important fishing centre in the country, and its prosperity was considerably increased after the construction of a harbour, for which Cromwell made a grant of £300. So famous did the place become that, according to one traveller, as many as twenty thousand people used to congregate at Dunbar during certain seasons of the year.

The trade in hides and in fish also gave a very great impetus to the manufacture of salt, and this article became a very important item in the export trade of the country. The manufacture, which formed one of the staple industries of the nation at this period, was chiefly concentrated along the shores of the Firth of Forth, where the absence of any muddy rivers depositing sediment along this coast, and, of still greater importance, the presence of coal in the vicinity, were the chief factors that favoured its development in this area. That the industry had become of national importance was clearly proved at the time when a proposal was put forward in the reign of Charles I. to limit the sale of salt in Scotland. A letter was immediately addressed to His Majesty by the Privy Council protesting against the proposed legislation. It was pointed out that not only would grievous injury be done to the salt industry which alone provided employment for 10,000 people, but the coal-mining industry of the country would also be seriously crippled and the shipping trade of many of the burghs would be entirely ruined, since coal and salt formed by far the most important items of the carrying trade upon which much of their prosperity depended.

Prestonpans was for a long time the chief seat of the salt industry, but salt pans were to be found for thirty miles along both sides of the Forth as far as Stirling. The rise both of the salt and coal-mining industries in the vicinity of Prestonpans seems to have been due to the efforts of the monks of Newbattle. A small community engaged in making salt existed at Prestonpans as long ago as the twelfth century, and about the same time Sey de Quinci granted a coal mine to the monks of the neighbouring abbey; in 1526 they erected a harbour at Morison's Haven from which to export the produce of the mines and the works.

During the sixteenth and seventeenth centuries the industrial development of the basin of the Forth must have been very marked; De Rocheford, writing at the time of the Restoration, refers to "the many good harbours and large towns along this gulf, with mines yielding tin, lead, and sea coal, in such quantities that the Flemish, the Dutch, the Danes, the Swedes, and even the French are served from hence. Moreover, in this same gulf they prepare salt which the Dutch purchase to cure the fish catched in the Scotch seas. . . ." Of these good harbours Leith and Bo'ness were the most important on the southern side of the Firth. Defoe spoke of Bo'ness early in the following

century as "a town that has been, and still is, of the greatest trade to Holland and France of any in Scotland after Leith." For this degree of prosperity there were several geographical reasons. Bo'ness had by this time superseded Blackness as the port of Linlithgow, of which the situation had given it a very prominent part in the national affairs at various times; as a royal burgh it had secured the monopoly of trade all along the coast between the Almond and the Avon. Moreover, owing to the fact that large boats could not proceed much farther upstream on account of the shallow and tortuous nature of the river, the bulk of the trade of Stirling, another very important royal burgh commanding the entrance to the Highlands, passed through Bo'ness, where the necessary change of transport could be easily effected. The importance of the port was also materially increased by the development of the western side of the kingdom, where in addition to Glasgow and various other burghs several thriving communities were seeking the nearest outlet for their trade on the eastern seaboard.

On the northern side of the Forth Alloa was an important river port early in the seventeenth century, and carried on a large trade in coal with Holland. Culross, like Prestonpans, owed much of its importance to the activities of the neighbouring abbey. So extensive was its trade in salt and coal that sometimes as many as a hundred and seventy ships were to be found at anchor outside the harbour, waiting to carry away the products of the salt works and coal heughs of Culross. Torryburn, now an insignificant village, was in the seventeenth century a flourishing port, possessing three ships with a total tonnage of 280 tons. Along the Fife coast a considerable trade was carried on at Inverkeithing, Burntisland, Kirkcaldy, Wemyss, Dysart, Leven, Elie, St. Monance, Pittenweem, Anstruther, and Crail, most of which, although "pitiful small towns," possessed several boats, while some of them attained importance as naval stations. Grain also formed a very important item in the export trade of many of the ports along both sides of the Firth; indeed so rapid was the agricultural development of the Lothians that, according to the statement of Taylor the Water-Poet, who says he was well informed in the matter, 80,000 boles, or 320,000 bushels, of wheat, oats, and barley were shipped from the port of Leith within a single year.

Leith, Bo'ness, and Burntisland were three of the six head ports along the east coast to which Thomas Tucker makes reference in his report, published in 1655. Dundee, Aberdeen, and Inverness completed the list; but, in addition, a considerable coastal trade was also carried on at several of the smaller ports, at Montrose, Arbroath, Perth; at Fraserburgh, Peterhead, and Banff; and also at Cromarty, standing on a bay where the greatest ships of burden might ride in safety; at Tain, and, still farther north, at Dunrobin, Thurso, and Wick.

But the most valuable part of Tucker's report for our present purpose lies in the evidence it affords of the progress of the western part of the country. Ayr and Glasgow were the only head ports along the west coast, but in explanation of this small number it is to be remembered that the character of the hinderland of much of the western half of Scotland prevented that wide distribution of important seaports to be

found on the eastern seaboard: moreover, almost the whole commerce of the country was in possession of the ports nearest the Continent, Ireland being practically the only market to which the merchants of the west had ready access.

When Tucker made his report Ayr had fallen upon evil times; owing to the silting up of its harbour it had lost much of its commerce, nor did its fortunes revive with the restoration of the monarchy, for in the last twenty or thirty years of the century Ayr lost no fewer than "fourty sail of ship." In the south-west Portpatrick, owing to its proximity to Ireland, had become a busy port. Between Ayr and Portpatrick there were a number of fishing villages, each with five or six boats and "not many more houses."

The chief interest, however, centres round the development of Glasgow. It owes its foundation, says Professor Gregory, to its situation on the rich soils of the Clyde valley and its relation to the agricultural and pastoral districts of the surrounding counties. But no less important was the fact that at this point the Clyde could be easily crossed, and the place thus formed a favourable site for the development of a trading community. We have already remarked that as early as the twelfth century an annual fair was held in the town; in Bishop Leslie's day it had become "the maist renoumed market in all the west"; and in the same century several manufactures added to its importance. By the middle of the following century its internal trade had reached such dimensions as to make Glasgow "one of the most considerable burghs of Scotland," both in structure and commerce. While its external trade was chiefly carried on with Ireland, some of its merchants had succeeded in establishing a connection with the Continent, and a few more daring and ambitious spirits, eager for a share in the lucrative colonial trade that was enriching the merchants of other countries, had endeavoured, but without immediate success, to find a market in the Barbadoes. A temporary stimulus was given to the commercial development of Glasgow at the time of the Commonwealth when freedom of trade was established with the sister kingdom. This privilege, however, was withdrawn at the Restoration, and it was not for another half century that the most prosperous period in the history of Glasgow began. Great as the place was destined to become, it was not because it stood upon one of Nature's great waterways: on the contrary, the condition of the Clyde at that time threatened to become a serious stumbling-block to the progress of the town. It is a remarkable fact that Glasgow was an important commercial centre and the residence of merchant princes long before it possessed either a harbour or ships of its own. Tucker reports that on account of the shallowness of the river "no vessels of any burden can come up nearer than within fourteen miles, where they must unlaid and send up their timber and Norway trade in rafts and floats, and all other commodities by three or four tons of goods at a time, in small cobbles of three, four, five, and none above six tons a boat." The unlading was carried out at Newark where, after a vain attempt on the part of the merchants of Glasgow to acquire land, first at Troon and then at Dumbarton, for the purpose of building a harbour to

accommodate their rapidly expanding commerce, docks were constructed in 1670 at which Port Glasgow has since taken its rise.

Thus not only had Glasgow become a very important centre of exchange in the course of the seventeenth century, but it also shared in the great industrial development that marked the period. It was not, however, till the union of the Parliaments was effected that the extraordinary development which has characterised the last two centuries of Glasgow's history became possible. Whenever the colonial markets were thrown open the enterprising merchants of Glasgow soon laid the foundations of a very prosperous trade, and so successful were their efforts that within a very few years they had secured the monopoly of the tobacco trade of the kingdom: scarcely less important was the trade they established with the sugar-planters of the West Indies. The expansion of their commerce as well as the jealousy of the merchants and shipowners who acted as their carriers made it desirable that the merchants of Glasgow should acquire a mercantile marine of their own: in 1718 the first ship belonging to Glasgow owners crossed the Atlantic, and some years later that improvement in the navigation of the Clyde was begun which is one of the most enduring monuments to the enterprise and intelligence of the merchants of the commercial metropolis of the country. In addition to opening up new markets for Scottish commerce, the Act of Union gave a great impetus to the development of manufactures at home. The linen industry was among the first to benefit by the removal of certain duties upon it. In 1725 the manufacture of linen was established in Glasgow, and so rapid was its progress that within sixty years three thousand looms were to be found in the burgh of Barony alone. When the manufacture of cotton superseded the making of linen as the staple industry in the west of Scotland, Glasgow enjoyed a very advantageous position in relation to the supply of raw material from beyond the Atlantic.

At the time of the Union Glasgow had become the second town in the country; its population at that date was probably about twelve thousand inhabitants, and it was called upon to contribute the sum of £3633 to the national exchequer, while the capital made a payment of £8455. The other towns in order at this time were Aberdeen, Dundee, Perth, Kirkcaldy, Dumfries, Montrose, Inverness, Haddington, Linlithgow, Stirling, Elgin and Ayr. Important as many of the burghs were at this date, there is abundant evidence from the burgh records of the time that, in spite of an antiquated economic conception according to which each article possessed an intrinsic just price, which made unimpeded trade impossible, and in spite of the privileges bestowed upon certain burghs and denied to other communities, there had arisen in the course of the sixteenth century a large number of prosperous communities that threatened to usurp the privileges of trade bestowed upon the royal burghs, and even to surpass them in wealth and importance. Within the precincts of the burgh of Glasgow at the time of the Union Hamilton, Paisley, and Greenock were all in possession of a thriving commerce which was particularly prejudicial, so it was complained, to the interests of the burgh.

Kilmarnock, Kilmaurs, Newmilns, Stewarton, Beith, and Largs were all flourishing communities within the precincts of Irvine, and they were so prosperous that their houses were in many cases superior to those of some royal burghs. But the plight of the royal burgh of Haddington at this time was the most pitiful. At one time it had been one of the most important burghs in the country, but chiefly owing to political causes it had fallen on evil times, until in 1707 Tranent, Prestonpans, Prestoun, Port Seton, Ormiston, Dirleton, Auldstocks, Stenton, Gifford Hall, Penston, and other places had become burghs of Barony in the vicinity of Haddington, which, according to the statements in the burgh records, "are now more frequented, and there is more buying and selling of goods therein than in Haddington, and by which places the mercat and trade of Haddington was upholden, which decay of trade therein and publict burdens imposed therupon has occasioned the decay and ruine of the town. . . ."

The prosperity of many of these unfree towns was due to the wide-spread development of manufactures to which reference has been made. The linen industry, for example, was for a time successfully carried on at such distant places as Edinburgh, Ayr, Berwick, Melrose, Ecclefechan, and Wigtown. The manufacture of linen thread was established at Paisley early in the century. The story of James Blake and the rise of the linen manufacture in Dunfermline, or of Lady Fletcher and her successful attempt to establish the industry in Saltoun cannot be told here. Reference, however, must be made to the great development of the linen manufacture in the Highlands, chiefly owing to the efforts of the Board of Manufactures which was created in 1727. All the northern counties shared to some extent in the development of the industry, but the trade was carried on with greatest success in Inverness, where employment was given to no fewer than ten thousand people throughout the villages of the county. Much of the flax was cultivated locally, but the ease with which the raw material from the Baltic could be imported either at Inverness or Avoch, and the facility with which a great part of the manufactured article could be exported to the West Indies, where it was in great demand on the cotton plantations, were important factors in developing the industry in this district. The making of linen was also successfully carried on at various towns and villages along the Moray Firth and the coast of Aberdeen and Forfar, whither the raw material could easily be carried from Narva or Riga. The woollen industry also seems to have prospered over a wide area. It was established wherever the raw material and an adequate water-power were available; accordingly many little industrial communities sprang up along the banks of the chief streams of the country. Thus when Loch wrote his treatise on the industries of the country, the village of Galashiels contained thirty looms and three waulkmills; Melrose had a hundred and forty looms; Hawick had sixty-five, while Kelso and Peebles each had forty. In the western part of the Southern Uplands, Moffat, Sanquhar and Dumfries participated in the woollen industry, which was also in a flourishing condition at Dunbar, Haddington, Dalkeith and Musselburgh. In Loch's time Stirling had become an important centre and possessed a

hundred and sixty looms, besides stocking and carpet frames: the woollen industry of Alloa gave employment to about five hundred people at that time. Perth, Aberdeen, and Inverness also had some share in the same trade.

Important as was the industrial development that took place throughout the country during the first half of the eighteenth century, it was quite overshadowed by the phenomenal expansion that occurred after 1750. Several factors contributed to bring about this development. By far the most important was the exploitation of the vast mineral resources of the country: then came the application of coal to the production of steam power, "the greatest town-forming influence" in our history; and finally there was the great improvement effected in the means of communication, both internal and external—the construction of well made roads, the building of canals, the development of railways, the improvement and extension of shipbuilding.

One of the most epoch-making events in the industrial history of the nation was the erection of the Carron Iron Works in 1760, the first to be erected on any large scale, although spasmodic attempts to establish the industry had been made before this date. The site of the works was originally determined by the abundant water supply furnished by the river Carron, and so rapid was the development of the concern that within a century of its foundation five villages had sprung up in the immediate neighbourhood of the works. The discovery of the economic value of the strata composing a great part of the Midland Valley led to a phenomenal development throughout this area. Within a few years collieries were opened up, and furnaces were erected on every hand; peaceful agricultural villages were suddenly transformed into smoky industrial towns; bleak and infertile tracts of land that had seemed economically worthless acquired an extraordinary value when found to overlie stores of minerals, and they soon became the scene of busy industrial communities. So great indeed was the demand for labour that the native supply proved inadequate, and an alien population established itself in several of the mining districts. An important factor in the development of the Midland Valley, and the rapid expansion of its metallurgical industries, was the close proximity of coal and iron to one another: at Gartsherrie Works, in Coatbridge, about the middle of last century a thousand tons of coal were consumed every twenty-four hours, and of this immense quantity nineteen-twentieths were mined within half a mile of the works.

Among the chief causes which led to the rapid development of the mining industries of the country towards the close of the eighteenth and throughout the nineteenth century was the great demand created by the substitution of iron for wood in shipbuilding, the construction of railways, and the widespread application of machinery to the textile industries. To this development many of the chief centres of population owe their rise, and it accounts for the great density of population throughout the Midland Valley.

Coatbridge, which from its position in the centre of the most valuable mineral field in the country may be regarded as the capital of

the Black Country of Scotland, was a village of 741 inhabitants in 1831; twenty years later its population amounted to over 8000; to-day it ranks as the seventh town in the country with a population of 37,000. Wishaw, a large village in the middle of last century, is now a town with over 15,000 inhabitants; the population of Motherwell at the last census was forty times what it was in 1841. Airdrie, at the end of the eighteenth century, was a small village, but by reason of its position on a rich coalfield, and its easy communication with the commercial metropolis of the country, it has risen to a town with over 22,000 people, and is the chief centre of population in New Monkland parish, which contains no fewer than fifty collieries and ironstone mines round which mining communities have been called into existence within comparatively recent years. On the same coalfield Bellshill (with a population of 8786 at the last census), Uddingston (7463), Mossend (3415), Holytown (4483), Newarthill (2156), and Larkhall (11,879) have arisen within the last sixty years.

The development of industrial communities on the Ayrshire coalfield has been no less marked. Muirkirk owes its existence to the discovery and smelting of iron ore towards the end of the eighteenth century, and since 1830 has been one of the most prosperous seats of the iron industry in Scotland. In 1700 Dalry consisted of only six dwelling-houses, and a century later its population did not number 800; but with the development of iron works in the neighbourhood the place has become an important business centre, and to-day contains over 5000 inhabitants.

The desolate Ardeer sandhills seemed a most unlikely place to become the seat of a great industrial community, but the erection of iron works about the middle of the century and of chemical works some years later soon attracted a very considerable population to the district, and although the latter works were abandoned later, the establishment of Nobel's Explosive Factory in 1873 added greatly to the prosperity of the place, and the works have continued to furnish employment for several hundred people. Smaller centres of population, dependent for their existence upon the collieries and iron works of the district, have sprung up in the vicinity of Dalmellington (at Benquhat, Burnfoothill, Craigneuk, and Waterside), of Kilwinning (at Fergushill and Doura), and of Kilmarnock which, although an old-established town, owes much of its present prosperity to the extensive coalfields and iron-foundries in its neighbourhood.

Within the last sixty years many mines have been opened up on both sides of the Forth, and while the development of this region cannot yet be compared with that in the west, especially the Lanarkshire coalfield, yet there are many large and thriving communities in existence to-day where but a few years ago there was scarcely any vestige of life and industry. Kelty (with nearly 4000 inhabitants in 1901), Cowdenbeath (7908), Crossgates and Lochgelly (5472) are all rapidly increasing centres of population which had no existence before the middle of last century. The opening up of the Fife coalfield has also encouraged the growth of the neighbouring seaports. Its good harbour

has made Methil a place of some importance for several centuries, but even as late as 1850 its population did not exceed 500. Within recent years, however, its growth has been very rapid, and during the last few years it has ranked as the leading port in Scotland for the export of coal; in 1909 nearly two and a half million tons were shipped from its docks. The development of the mineral resources of the neighbourhood has also added very considerably to the importance of Burntisland, from which port coal to the value of over £1,000,000 was sent out in 1909. Kirkcaldy, Dysart, and West Wemyss have also participated in the same export trade.

On the opposite side of the Forth the ports have received a similar impetus to their trade by the opening up of the valuable mineral fields that form part of their hinderland. Coal and manufactures of iron and steel are among the most valuable items of the export trade of Leith, Bo'ness, and Grangemouth. On the Midlothian coalfield Gorebridge, numbering 1379 inhabitants at the last census, Loanhead (3011), Newtongrange (2406), Bonnyrigg (2924), Rosewell (1425), and New Craighall (1633) are among the places which owe their existence and development to the exploitation of the mineral wealth of the district. The opening up of several collieries farther east is not only attracting considerable numbers of people to the vicinity, but may eventually restore to Prestonpans something of the importance it enjoyed before the passing of the Stamp Act.

It was in the middle of last century also that the economic value of the Lothian shale fields was first realised. In 1857 not one of these oil shales was being worked; to-day Broxburn (with 7099 inhabitants in 1901), Uphall (with nearly 1000), East Calder (1094), Midcalder (703), West Calder (2652), Pumpherston (1462), Addiewell (1591), Oakbank (933), Philipstoun (644), and Dalmeny are entirely dependent upon the mines and oilworks for their support. In the south and south-west of Linlithgowshire large tracts of barren land have within the last fifty years become the scene of great industrial activity, and many centres of population have grown up in this area; among them are Bathgate, Armadale, Whitburn, and Fauldhouse, with a combined population at the last census of over 15,000. The development of the Stirlingshire coalfield has not only given rise to considerable centres of population in the vicinity of Falkirk, at Slamannan, Avonbridge, Polmont, and in the neighbourhood of Bannockburn, but has also greatly contributed to the growth of Grangemouth. In 1861 the quantity of coal sent out from this port was 64,000 tons; in 1909, in addition to large exports of metals and machinery, over one and three quarter million tons of coal were shipped. Coal forms nearly 90 per cent. of the export trade of Bo'ness, while on the opposite side of the Forth Alloa is almost entirely dependent for its outgoing trade upon the output of the pits of the Clackmannan coalfields.

It is, however, in the phenomenal expansion of Glasgow and its neighbourhood since the middle of the eighteenth century that the full effect of the development of the mineral resources of the country, and of the industrial revolution which followed it, is best exemplified. Its

central position in relation to the mining centres of Ayrshire, Lanarkshire, and Stirlingshire greatly increased the importance of Glasgow, and led to a very rapid expansion of its population, which at the beginning of the nineteenth century numbered about 77,000 persons. Within half a century its population had grown to over 300,000, and had far outstripped that of the capital. The introduction of machinery into the textile industries, the substitution of iron for wood in building the ships required for an ever-extending commerce, as well as for purposes of defence, gave an immense impetus to the development of engineering on the banks of the Clyde, and to-day Glasgow is the chief seat of the metallurgical industries of the country. Along both banks of the river small fishing villages were rapidly transformed into busy industrial centres, engaged in various branches of the engineering and shipbuilding industries. Large centres of population have thus been developed at Yoker, Clydebank, Dalmuir, Old Kilpatrick, Bowling, and Dumbarton on the north bank of the Clyde, while, on the opposite side, Govan, Port Glasgow, and Greenock have become important towns. If the commercial development of the Clyde basin was hampered for several centuries on account of its distance from the Continental markets, adequate compensation has been forthcoming during the last century and a half, and the Clyde now finds itself in touch with the greatest commercial highways in the world.

Besides giving rise to many new industries, the economic changes that marked the close of the eighteenth and the whole course of the nineteenth centuries entirely revolutionised the conditions and distribution of the industries already in existence. Before the industrial revolution the industries of the country were essentially home industries, and it was almost true to say that every cottage had its loom. The introduction of machinery rendered that no longer possible. The capital involved in carrying on the industries under the new methods tended to concentrate the manufacturing centres in the most favourable situation, where there was an adequate supply of power to be obtained, where the raw material could be acquired most readily and cheaply, and where there was easy access to suitable markets. It was such conditions as these that favoured the development of the cotton industry on the western side of the country, where it was first established at Rothesay in 1778. It was the presence of an abundant water supply that led David Dale in 1783 to select a piece of marsh land on the banks of the Clyde as a site for his cotton factory: fifty years later New Lanark had a population of over 1900 inhabitants. Although the manufacture of cotton ultimately declined, except at Paisley, in the middle of the century there were as many as 149 factories distributed over the counties of Lanark, Renfrew, and Ayr, affording employment to over 31,000 persons. The linen industry, on the other hand, gradually became concentrated in the eastern counties, the proximity to the source of supply round the Baltic being the most important geographical factor in attracting the industry towards the eastern seaboard. Thus while the manufacture was practically abandoned in most of the small villages throughout the country where it had been formerly carried on, such places as Dunferm-

line, Forfar, Brechin, and Montrose rose in importance as manufacturing centres. Dundee became the leading port for the importation of the raw material, and for many years it enjoyed a monopoly of the jute trade of the world. In 1838 1136 tons of jute entered the Tay port; thirty years later the imports exceeded 58,000 tons, and although Calcutta has become a very keen rival, Dundee in 1908 received jute to the value of over three and a half million pounds.

The woollen industry also has given rise to many centres of population within the last century and a half, and has infused industrial activity into a number of places which otherwise would probably have remained sleepy hamlets. The population of Tillycoultry did not exceed 900 inhabitants about the close of the eighteenth century; but owing to the erection of several mills during the next fifty years its population rose to more than 3000, and to-day stands at a little over 4000. In 1855 a mill was erected on the banks of the Tweed where the Walker Burn enters the main stream. At that date there was not even a village on the spot, but, within six years, a community numbering over 300 people had sprung up in the vicinity of the mill; twenty-five years later Walkerburn contained nearly 1300 inhabitants. In 1795 Alva was nothing more than a mere village, but within the next fifty years eight woollen mills were established in the neighbourhood, and in 1841 its population exceeded 2000; to-day it almost reaches 5000 inhabitants.

Before, however, the widespread development of the national resources could be carried out, a great improvement had to be effected in the means of communication throughout the country. Referring to the county of Haddington, the writer in the *New Statistical Account* makes the statement that long after the middle of the eighteenth century scarcely a mile of continuous hard road was to be found throughout the district except between Douglas and Ravenshaugh. An act passed in 1751 resulted in a great improvement being effected on the roads throughout the country, and "before many years passed by, the public roads became smooth and easy; produce was conveyed to markets at a tenth of the former cost, and in a tenth of the former time; and a complete revolution was made . . . in the whole economical condition of the land."

As long ago as the reign of Charles II. a proposal was made to connect the Forth and Clyde by means of a canal, but the scheme did not take practical shape until 1768; five years later the first section was opened between Kirkintilloch and the Forth; in 1790 through communication was established between the east and west coasts. A port was established at the eastern end of the canal, and, chiefly on account of its superior harbour accommodation, Grangemouth has eventually surpassed its ancient neighbour Bo'ness.

Towards the close of the eighteenth century the depopulation of the Highlands was going on at such an alarming rate that, partly in order to check the tide of emigration, but also with the more permanent object of opening up the country and providing an alternative route to the stormy and dangerous Pentland Firth, the construction of a canal through Glenmore was begun. It was completed in 1823, and for a time

Inverness, at its head, probably did derive some little benefit from it, but it cannot be said that the Caledonian Canal has realised the anticipations of its promoters. Neither has it become a great commercial highway, nor has it attracted to its banks the industrial enterprises that were looked for. For purposes of commercial navigation the canal is now practically obsolete, though still employed at certain seasons of the year for the passage of fishing boats and of small tourist steamers from sea to sea. For the comparative uselessness of the canal there are various reasons, connected with its dimensions, its lockage system, and its administration, but more important than any of these is the simple geographical fact that there is no prosperous industrial centre immediately to the south of the canal, for which it might form a connecting link with the northern part of the kingdom.

But the most remarkable development in the means of communication and of transport did not begin till the second decade of the nineteenth century. In 1812 a railway, worked by horse traction, was opened for traffic between Kilmarnock and Troon; in 1826 a line was inaugurated between Monkland and Kirkintilloch, and five years later the coalfields of Dalkeith were brought into communication with the capital by means of a railway which continued to be drawn by horses until 1845. In 1834 a company was formed for the purpose of running steam carriages over the turnpike roads of the country, but the first experiment, between Glasgow and Paisley, proving a failure owing to the bursting of a boiler, the scheme was abandoned. Within the next few years, however, twelve railway schemes were promoted, and all but one were successfully carried through; since that time the network of railways has been gradually extended so as to cover almost every part of the country. The effect upon the industrial development of the country of the introduction of railways can scarcely be exaggerated. Railway construction gave a very great impetus to the coal and iron trades, and therefore to the growth of mining communities in different localities; it established the engineering industry in various centres; it necessitated the erection of offices and works, as at Cowlairs, Carstairs, and in the vicinity of the various termini throughout the country. No less important has been the influence of the railways upon the commerce of the country; they have opened up new markets and brought the seaports into immediate connection with their hinderlands.

Within the last quarter of a century the improved travelling facilities provided by the railway companies, the rapid and cheap means of transport made possible by the introduction of electric traction on the railway and tramway systems throughout the country, and, still more recently, the advent of the motor car, have all exercised a very important effect upon the development of the towns. In the first place, many of the rural villages and small country towns within easy reach of the great industrial centres have risen in importance as the residential quarters of the more prosperous section of the business or industrial community. Thus some of the watering-places in the vicinity of Glasgow have become exceedingly prosperous as the homes of many of the merchant princes of the metropolis. Broughty Ferry, Tayport, and the other

watering-places in the neighbourhood of Dundee owe their prosperity to similar circumstances. For the same reason Corstorphine, Liberton and Eskbank are fast becoming suburbs of Edinburgh, while Aberlady and North Berwick are rapidly growing in importance as the residential quarters of the more wealthy members of the professional and business classes of the capital.

On the other hand, the extension of the means of communication is having the effect of amalgamating neighbouring industrial centres. The magnificent tramway system of Glasgow has tended to link together many centres which but a few years ago were independent communities. The same process is at work in the neighbourhood of Kirkcaldy and Leven, while on the southern side of the Forth the construction of the tramway from Edinburgh through Portobello, Joppa, Musselburgh, Prestonpans to Cockenzie will eventually produce a continuous line of population throughout the whole extent of the route.

Another result of the extension of railway facilities throughout the country is to be noted in the rise of certain centres as fashionable summer resorts. Thus the tourist industry has brought prosperity to many of the Highland villages which before the advent of the railway to the neighbourhood were in a decaying condition. Most of the villages along the valley of the Spey and the Dee as well as the watering-places along the coast owe their importance to, and are dependent for their existence upon, the annual influx of visitors from the large cities and towns.

While it is inconceivable that there can be again any development of centres of population at all comparable to that which characterised the nineteenth century, yet even within comparatively recent years the introduction of new industries has given rise to new centres of population. Since the Singer Sewing Machine works were erected at Kilbowie in 1883 a thriving town has developed in the neighbourhood. The motor car industry, while it has given rise to no new centre of population, has added considerably to the importance of various towns where engineering was already being carried on, and where an adequate supply of skilled labour was at once forthcoming. A great amount of capital has been expended in the erection of motor works at Alexandria, Yoker, Scotstoun, at Granton and also at Dundee, where the "assembling" of motor cars has become an important industry. The increasing cost of fuel as well as the development of electricity as a motive power may in the immediate future give rise to thriving centres of industry in the deserted glens of the Highlands of the country. Indeed this process has already begun, for a rapidly growing village has sprung up at the Falls of Foyers, where "the most magnificent cataract in Britain" has been harnessed to supply power for the aluminium works established there in 1895. An even more important development is at present going on near Ballachulish, where a large village is in course of erection to accommodate the employees connected with the works belonging to the Loch Leven Water and Electric Power Company. These works will eventually furnish employment for at least twelve hundred people, and the new village will soon contain several thousand inhabitants. But perhaps the most interesting example

of town development in our own day is to be found at Rosyth. Between Limekilns and North Queensferry there was scarcely a house but a few years ago; now operations are being rapidly pushed forward which must result in a large town springing up in this vicinity; and the rise of a dense industrial population at this part of the coast will also have an important bearing upon the prosperity of the adjacent communities lying both to the east and the west of the naval base.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

At a meeting of Council held on the 6th May, the following ladies and gentlemen were elected Ordinary Members of the Society:—

Miss Alice Dalrymple.
Miss E. A. Suverkrop.
Colonel John D. Young.
Arthur Lee De Lisle.
E. Forsyth (Mexico).
D. Hay Peffers.
William R. Kermack.

The following were elected Teacher Associate Members of the Society:

Miss B. B. Rogers.
Miss M'Croben.
T. S. S. Aiyar.
Miss A. L. M'Mullen.

Diploma of Fellowship.

The Ordinary Diploma of Fellowship was conferred on George M. Richmond, subject to his compliance with the prescribed conditions.

Appointment of New Secretary.

Mr. George G. Chisholm, M.A., B.Sc., Lecturer in Geography at the University of Edinburgh, was unanimously appointed Secretary of the Society, in the place of Major W. Lachlan Forbes who has resigned.

Lectures in May.

Commander Robert E. Peary, C.E., U.S.N., lectured on his expedition to the North Pole, before the Edinburgh and Glasgow Centres, on the 24th and 25th May respectively.

Mr. George R. Gill, F.R.G.S., gave a demonstration on the practical method of teaching geography, on the 26th May.

Address to the King.

The following address has been sent to His Majesty King George V. on behalf of the Society, condoling with him upon the death of his Royal

Father, King Edward VII., and congratulating him on his accession to the throne :—

To the King's Most Excellent Majesty.

THE LOYAL AND DUTIFUL ADDRESS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

May it please your Majesty, —

We, the Royal Scottish Geographical Society, who enjoyed the honour of the patronage of your Royal Father, the late King, from the first year of his reign, humbly desire to express our profound sympathy in the sorrow which afflicts your Majesty, the Royal Family, the Nation, and the Empire.

Seldom has the death of any Sovereign called forth such universal lamentation as that of your Royal Father, lamentation not merely from within the Empire, throughout which he was regarded with love and admiration, but also from nations abroad, who knew him as one who promoted peace and good-will throughout the world.

We rejoice that your Majesty has graciously declared your resolve to follow the example of your Royal Father.

We ask leave to express our sincere and ardent loyalty and devotion to your Majesty and to your Royal Consort, Queen Mary ; and we pray that your Majesty's reign over a loyal people in a United Empire may be prosperous and prolonged.

Jas. Geikie, *President.*
J. G. Bartholomew, *Hon. Sec.*
Geo. G. Chisholm, *Sec.*

May 17, 1910.

GEOGRAPHICAL NOTES.

Polar.

Dr. Charcot's Antarctic Expedition.—We have received, through Dr. Bruce, some further information in regard to the scientific observations made by the members of Dr. Charcot's expedition. A series of soundings was taken, and we have been furnished with a list of the more important of these. In most cases at each sounding the temperature of the water was taken at the surface and at the bottom, together with its density, while in a few instances serial temperatures were taken at every 100 metres. About twenty hauls of the dredge were also made, but the depths did not exceed 500 metres. The soundings continue the work of the *Belgica* and of Dr. Nordenskiöld's expedition.

The most important general points are that the continental plateau in the vicinity of Graham's Land has a very irregular surface, while Peter I. Land apparently rises very abruptly from the ocean depths. A shallowing in lat. 70° S. and long. 119° W. perhaps indicates the vicinity of land, while a sounding of over 5000 metres in lat. 66° S. and long. 118° W. indicates the presence here of a deep depression of the ocean floor.

We have also been furnished with tables showing some of the meteorological results of the expedition, but these are discussed in a paper by Mr. Mossman which we hope to publish next month.

The American Antarctic Expedition.—It is announced that this expedition (cf. p. 151) will not start next autumn as proposed, owing to the fact that the necessary funds have not been raised.

General.

New Geographical Society.—We are informed that a "Geographical Society of Servia" has just been founded at Belgrade. The object of the Society is twofold: first, to promote the study of geographical science in the large sense (including the correlated sciences), and, second, to endeavour to spread a knowledge of geographical facts, in so far especially as they relate to the Balkan peninsula in general and to Servia in particular. Two kinds of meetings are to be held, the one scientific and the other of a more popular type. Starting from January 1911 a journal will be published thrice a year by the Society.

The Atlantic Deep-Sea Expedition.—The ss. *Michael Sars* (cf. p. 271) experienced rough weather in the Bay of Biscay, which gave rise to difficulties in connection with deep trawling, but the party made interesting physical observations along the coasts of Spain and Portugal. The temperatures and salinities show that these are very much influenced by the outflow of water from the Mediterranean. The ship was then with some difficulty anchored in the middle of the Straits of Gibraltar, in about 300 fathoms, where current measurements of the inflowing and outflowing current were taken. These show an outflow at the bottom of nearly five knots, over a very rocky floor. The wire rope ultimately parted and the anchor was lost.

EDUCATIONAL.

Recently animated discussions have been taking place in the United States on the kind of geographical teaching most suitable for Secondary Schools there. At the 1908 Meeting of the Association of American Geographers, a Committee was appointed to consider the question, and their Report was presented to the 1909 Meeting of the Association, since which various articles on the subject have appeared in the *Journal of Geography* and elsewhere, while there is one also in the London *Geographical Journal* for April last, by Mr. R. H. Whitbeck of the University of Wisconsin. Without following in detail the various phases of the discussion, it may be interesting to note that up to the present geography in the schools mentioned has been physical geography, some of it physical geography of a very detailed kind. The fact is

perhaps related to the other fact that some of the most distinguished American geographers have been geologists in the first instance, and the syllabuses discussed seem to indicate that the "geography" of the schools leans very strongly towards geology. The Report alluded to above recommends that physical geography should not be displaced from the syllabus, but should be followed by a course on the regional geography of the United States and Western Europe. To this recommendation is appended a suggested syllabus of physical geography, of a tolerably comprehensive nature, so that the course is obviously intended to remain largely physical. In the *Journal of Geography* for February last there appears a very practical and interesting criticism of this Report by Miss Bertha Henderson, who wants to "humanise" High School geography to a much greater extent than is suggested in the Report. The Report suggests that about one half year be devoted to physical geography, and the remainder of the only year available to regional geography. Miss Henderson would add to the regional survey of North America and Europe that of an Oriental country such as Japan or China, and would give the whole of the available time to this regional survey, with the exception of about ten weeks of physical geography, to come at the end of the course and to be of the nature of a summing up. She points out that a great deal of physical geography may be taught incidentally during the course of the regional survey, and that so studied the subject has an interest which it has not when studied from the purely scientific standpoint. As she says, no boy can be expected to take an interest in the migrations of the heat equator, when it is a subject which he never hears mentioned outside school, while he can be induced to interest himself in, for instance, the climate of Panama, which is a subject of current interest. Similarly the question of the variations in the length of day and night can be rendered much more directly interesting if it is studied in connection with Alaska and the conditions of life there. Miss Henderson goes on to emphasise the importance from several standpoints of giving some notion of the civilisations of the East, and no one who has corrected many examination papers, and seen how widespread among students is the notion that "civilised" means European can fail to agree with her. The whole paper, though short, is most suggestive and interesting.

It may be useful to note that the Report appears in full in the March number of the *Journal of Geography*, and shows clearly that for American geographers at least it is not true that all geography is human geography. Mr. Whitbeck's paper in the *Geographical Journal*, though generally sympathetic with what is called the "humanising of geography," points out some dangers and difficulties in attempting to carry out the process rapidly, dangers and difficulties which are certainly worthy of attention.

An article on "Climate in Some of its Relations to Man," in the *Popular Science Monthly* for March, by Professor R. Ward, may be recommended to the notice of teachers. It does not contain anything strictly speaking novel, but there are a variety of minor points which will be found of interest in giving lessons on climate and weather. Thus

there are some interesting figures quoted in illustration of the dictum that "night is the winter of the tropics," or in other words that the diurnal variation of temperature in the tropics is much greater than the seasonal. For example, at Equatorville on the Congo the difference between the average temperature of the warmest and coldest months is only a little over 2°, while the diurnal variation may be 14°. Another point, which is worth note in connection with the study of seasonal rainfall, is that in the tropics although the rainy season typically coincides with the vertical sun, *i.e.* with "summer," yet, owing to the effect which the clouds have in lowering the temperature, this season is sometimes called "winter" by the inhabitants. This may serve to illustrate the danger of using the names of the seasons of the temperate regions in talking of tropical climates. There is hardly a set of examination papers which does not illustrate the confusion produced in the minds of children by this habit.

Professor Ward also emphasises the great changeableness of the weather of temperate zones, as compared with the monotony of the tropics. In the North Temperate zone seasonal temperature ranges may be enormous. Thus in north-eastern Siberia there is a maximum seasonal difference of 120°. A good many other similar points of interest will be found in the original paper.

NEW BOOKS.

ASIA.

L'Empire Japonais et sa vie économique. Par Joseph Dautremer, Consul de France. Paris: E. Guilmoto, 1910. *Prix* 6 *francs.*

Unlike most books on Japan, this is a plain, practical, and valuable work on the economic aspect of one of the most progressive countries in the world. The Geography, Climate and Physiography of Japan are discussed, with its Population, Commerce, Manufactures, Army and Navy, Roads and Railways, Constitution, Law Courts, and Religion, although the author remarks—"As for religion, the Japanese have none or very little, but, on the other hand, they are very superstitious." As to their character, "one of their leading features is dissimulation. Accustomed from their earliest childhood to display nothing on their countenances either of grief or joy, the Japanese have an impenetrable physiognomy, and it is impossible to divine their thoughts. They conceal all their ideas behind a constant smile, which we see everywhere and under every circumstance." Further on, he tells us that the "Japanese tradesman has not the reputation of being reliable and faithful to his word. The Japanese authorities have made praiseworthy efforts to persuade their countrymen to be more sincere in their business relations, and it is to be hoped these efforts will not be in vain. But the Japanese is much less a trader than is a Chinaman, and all having to do with the two nations are unanimous in preferring the Chinese. Besides, all the great European houses established in Japan and all the banks have Chinese cashiers and clerks, never Japanese. The Japanese tradesman never scruples to refuse to take delivery of goods if, during transit, the price has changed to his disadvantage; he knows that a European will prefer to have his goods returned rather than waste his time in litigation." At the same time, the Japanese possess many sterling

qualities, "courage, patience, perseverance, and it is really remarkable what they have accomplished in so short a time. They deserve all praise in bringing to their transformation a robust determination, an intelligence, and an application which can only be regarded as extraordinary. Yet it is really only an *élite* which has succeeded in transforming itself more or less completely and adopting Western ways. The mass of the population remains unchanged, and any one going into the interior of Japan from some of its ports and cities, where foreigners reside, will find there the unaltered Japan of fifty years ago." The population of Japan increases annually in a manner unknown in Europe, even in Germany or Russia. The author combats the idea that this is the cause of Japanese emigration, for there are still large portions of Japan to be peopled. He considers that it is love of adventure and not a need for new territory which makes the Japanese leave their country. They are now found in China, North and South America, Hawaii, the Philippines, Manchuria, and Korea, and they have raised dissensions in California and Canada. Although every Japanese is a born soldier, and a formidable army and navy are always kept ready for action, Japan is really an agricultural country, and 60 per cent. of its population live by the land. The author is not afraid of Japanese manufacturers becoming serious rivals of European ones, although undoubtedly Manchester and Bombay will find their Chinese market for cotton goods very much encroached on by the Japanese. In every department of economic life the author gives interesting and instructive details, and his book is accompanied by excellent illustrations, and a map showing the expansion of Japan by the addition of Korea, Formosa, and South Sakhalin.

Researches on Ptolemy's Geography of Eastern Asia. By Colonel G. E. Gerini, M.R.A.S. Published in conjunction with the Royal Geographical Society. London: Royal Asiatic Society Monographs, vol. ii.; Royal Geographical Society, 1909.

Claudius Ptolemæus, the distinguished astronomer and geographer who lived in the second century of our era, was the author of many works, and more especially of a *System of Geography*, in eight volumes, which held the field against all rivals till the fifteenth century.

The advance of astronomical and geographical science and knowledge, however, naturally and inevitably, undermined an authority, once so great that it was quoted by Calvin to support one of his charges against Servetus, and the once universally accepted Ptolemaic systems both of astronomy and of geography sank into oblivion. In the massive and erudite volume now before us we have the results of the efforts of Col. Gerini, M.R.A.S., to elucidate Ptolemy's extra-Gangetic geography. The book may be briefly described as a more or less successful attempt to vindicate the reputation of the great Alexandrine geographer from the distrust, if not contempt, under which it has lain for many centuries. Col. Gerini himself describes his work as a "*rudis indigestaque moles* of facts and information, rather than a readable sketch planned to catch the roving eye of the general reader," and we are fain to confess, that we fear the circle of readers to whom it will appeal will be somewhat narrow. The difficulties of his self-imposed taste were of themselves enormous, and to them must be added the fact, that Col. Gerini could only spare for it the leisure moments of a busy life, spent in researches on the early history of Siam and its border countries, far from libraries and books of reference. His intention, he tells us, was to contribute his notes as a series of articles for the *Journal of the Royal Asiatic Society*. The first article appeared so long ago as 1897. Nearly the whole of the present book was in type by 1904, but its com-

pletion had to be delayed till 1908. In these intervals wholesale alterations and corrections had to be made because of fresh investigations and discoveries.

A prolonged and minute study of Ptolemy and his critics seems to have convinced Col. Gerini that no real progress could be made in the task of clearing up what seemed to be gross inaccuracies and misstatements, until one or two places or localities could be recognised and marked down beyond a shadow of doubt. If this could be done, then the true latitude and longitude of these places could be ascertained, and a formula of correction could be calculated which, when applied to other adjacent places, would fix their true location.

It was not till the end of 1895, that he succeeded in finding a base-point by identifying "Ptolemy's Akadra and Pithousbaste with the Bay of Ko-Tron or Ka-Dran (the *Kadrang* of the Arab navigators of the ninth century), corresponding to the present Hatien on the Kambojan coast of the Gulf of Siam, and Pantaineas (French spelling) or Panthai-más ('golden-walled citadel') near by, the initial point from which Hindu civilisation spread out over Kamboja."

This first success soon led to the identification of Samarade, Zabai, Aganagara, Takola and other principal stations of Ptolemy on the coast of the Malay Peninsula and Cochin-China, after which the rest was comparatively easy.

The book will be found a treasury of information and interest, not only to the student of ancient and modern geography, but to the historian, ethnologist, and antiquarian. The index of names extends to more than a hundred pages of print, and there are copious and voluminous notes as well as several useful maps and tables.

Auf neuen Wegen durch Sumatra. Forschungsreisen in Ost- und Zentral Sumatra (1907). Von Max Moszkowski. Mit zwei Karten, drei Tafeln und 243 Abbildungen nach Originalaufnahmen und Handzeichnungen. Berlin: Dietrich Reimer, 1909. Preis elegant gebunden, *M.* 14.

The interest of the Malay Archipelago for the naturalist has already found classical expression in the well-known works of Russel Wallace and H. O. Forbes. This volume, by a German biologist, is well worthy of an honoured place beside these. It is the record of two years' travel in Sumatra, and while it of course includes ground already described by Wallace and Forbes, it claims to break "new ground," and devotes special attention to the north-west region of the island—a part almost wholly untouched by earlier travellers.

The author describes his book as "a modest contribution to the history of the development of civilisation," or as "a series of pictures of the infancy of the human race." In a discursive, unsystematic, but none the less interesting fashion, he deals with the physiology, psychology, and the religious beliefs of the natives, and describes their social life, and the marriage and funeral ceremonies current amongst them. He claims to have penetrated large portions of the island hitherto unexplored, and to have discovered a race of natives, the Sakais, untouched as yet by white civilisation. He fills out his description of the primitive simplicity of these people by an interesting account of the fauna and flora that flourish in "the blue-green twilight of the primeval forests, and in the brilliant sunshine of the clearings."

Although the main interest of the book thus lies in the region of human biology, it has many other merits. It is written with considerable literary skill. We cannot recall any book that succeeds better in conveying to the reader the impressions produced on the traveller, as he sails up the quiet streams through the endless forests far from the din and restlessness of our crowded Western

civilisation. As one lays down the book, one feels that one has not only learned much about an interesting island, but also made the acquaintance of an attractive and versatile personality. There are many touches of humour in the book. Although Moszkowski learned a great many native words, the gain, as he points out, was not all on one side. His boatmen soon picked up his shout of *Obacht* (look out!, and used it to denote obstacles of all kinds, and *Schafskopf* (blockhead) was applied by the boatmen to each other with great gusto. The author expresses the hope that the presence of these words in the native vocabulary will by and by provide a sweet nut for future philologists to crack!

There is one passage—pp. 66-67—of the nature of an *obiter dictum*, with which few readers will agree. The author found some remarkable examples among insects of that protective resemblance to their surroundings which, since Bates, has been known as mimicry. There is room, of course, for many questions as to the efficiency of Natural Selection as the sole factor in Evolution. But Moszkowski goes further, and asserts that Natural Selection is not at work here at all. His quarrel is not with the doctrine of evolution, but with Darwin's doctrine of Natural Selection as the *modus operandi* of nature in her work of development, and he rejects Darwin's estimate of the evolutional value of individual variation on the following grounds: (1) The insects alight, more often than not, where their "protective resemblance" does not come into play. (2) While his European eyes were frequently deceived, his native servants were able to discover even the best protected specimens at a considerable distance. (3) The enemies which depend on their powers of sight are considerably fewer than those which are guided by smell, and a mimicry of smell would, he maintains, be far more serviceable than one which aims at deceiving the sight. He says he has been converted into an out-and-out opponent of Darwin's doctrine, but he is not likely to find many adherents among those who have followed the work that has been done since the famous papers of Bates and Wallace.

The most ambitious portion of the book is the last three chapters, in which the author seeks to follow the evolution of the dwelling-house, from the most primitive form of protection from the elements, to the most elaborate specimen of luxurious dwelling as found amongst the natives. His account of the evolution of the fire-place, and his exposition of the way in which the gradual division of a house into kitchen, living-room, sleeping-room, the introduction of windows, and so on, can be shown to keep pace with the increase of civilisation, is a very instructive piece of writing, and the writer's meaning is made still clearer by an excellently reproduced series of photographs and sketches.

L'Inde Britannique. Par Joseph Chailley. Paris: Librairie Armand Colin, 1910. *Price* 10 *fr.*

Administrative Problems of British India. By Joseph Chailley. Translated by Sir William Meyer, K.C.I.E. London: Macmillan and Co., Limited, 1910. *Price* 10*s. net.*

Long years ago Burns sang to us

> "O wad some Pow'r the giftie gie us
> To see oursels as others see us!"

and if any of the past or present administrators of India care to echo that wish now they may have it fulfilled by perusing the intensely interesting volume now before us. Shallow, one-sided, vindictive, stupid, ill-informed, hostile criticism we have in abundance. But the criticism of M. Chailley is of a different category, and one

which we can welcome with both hands. In the first place, he has thoroughly prepared himself for his difficult and arduous task. He has read much ; he has visited India twice ; he has studied our administration elsewhere ; he placed himself in communication with those who were in a position to really help him in his special study of Indian administration, and from them he got the cordial assistance and welcome, which are always gladly accorded to all earnest and honest students. The book, he tells us, cost him twenty years of thought and ten years of work. Add to this that he secured the assistance of Sir William Meyer, K.C.I.E., a distinguished member of the Madras Civil Service, who corrected facts and dates, and has also translated the work. The author has been a member of the Chamber of Deputies for several years, and won his literary spurs so long ago as 1892 by his *La Colonisation de l'Indo-Chine*. Lastly, clear-headed, observant, astute, he is a friend, although a candid friend, of Great Britain, and his object in writing the work is not so much the enlightenment of Great Britain as the benefitting of the French Colonial Party in their dealings with their eastern colonies. The general result is, that we have a work of remarkable power and interest, well deserving the careful study of British and Indian officials and statesmen of every shade of policy.

A perusal of the book shows that M. Chailley has thoroughly grasped and does not lose sight of the bed-rock fact, that India, with its three hundred millions of inhabitants speaking one hundred and forty-seven idioms, and its continental area, is not a nation. "L'Inde n'est pas une nation. C'est une agglomération de populations, qui diffèrent par la race, la religion, les institutions, la langue, et que seul a juxtaposées le hasard des dominations, quelques-unes sous les Mogols, toutes sous les Anglais. Elles vivent côte à côte, sans se pénétrer."

M. Chailley sees clearly, that what is an administrative problem in one place or with one people in India, need not be a problem elsewhere. For example, it may be fair to say that the question of the separation of the judicial from the executive service is a serious problem. But it is serious only in certain places in India. In by far the greater part of the country not one man in a hundred ever gives the matter a thought, and of those who do think about it, not a few would from sheer ignorance or innate conservatism vote for the present system. The conspicuous merit of M. Chailley's work is, that he knows and states both sides of the various problems with which he deals with scrupulous fairness and with an unusual mastery of the most recent facts. He thoroughly appreciates the multiform difficulties of the British administrator, because he knows their historical genesis and that the hand of Government has been from time to time forced by circumstances over which it had practically no control. He rarely ventures to put forward any nostrum or theory of his own by way of solution ; and when he does make a suggestion, it is always couched in moderate and tentative language, the result of his thorough grasp of the difficulties of the situation, and his wise sympathy with those who are immediately responsible for the administration. We hope that this valuable and important contribution to our knowledge of India will be carefully studied by a very wide circle of readers all over the world, either in the original or in the excellent translation by Sir W. Meyer, K.C.I.E. One very desirable result might be, that we would hear less of, or at any rate give less credence to, the oft-repeated sinister and discreditable allegations of high-handedness on the part of Indian judicial officers. M. Chailley records his experience and observation in these words. "La loi—ce qu'elle veut, ce qu'elle tolère, ce qu'elle encourage—domine toutes les décisions. En dehors de la loi, pas de salut. Pas d'administrateur qui songe à la violer, ou à la tourner, ou à s'en passer. En conséquence nulle place, en quelque circonstance que ce soit, pour l'esprit jacobin ; aucune tentation de recourir, contre la loi ou en l'absence de loi, aux mesures dites

de salut public." This unimpeachable testimony to the moderation and impartiality of the judicial staff is of exceptional value, and we may add that, to the ordinary man, it will seem obvious that so long as the executive officers, when acting in their judicial capacity, retain so profound a respect for, and absolute an adherence to, the law of the land, there does not seem to be so urgent a necessity for separating the executive from the judicial service.

AFRICA.

Things seen in Egypt. By E. L. Butcher. London: Seeley and Co., 1910. *Price* 2*s. net.*

This is a most charming little volume. It can be read with delight from cover to cover, and the clear illustrations with which it abounds make it the most agreeable of handbooks. It is impossible, moreover, to peruse it without a thrill of emotion, whether we stand with the writer in the rock temple of Rameses the Great, where the four giant figures of the Pharaoh, for whom Moses is said to have conquered Nubia, sit as they have sat for 3000 years gazing with calm eyes upon a dwindling world, or, again, as we are brought face to face with the workaday world of to-day and have to recognise the difficult but not hopeless task which our countrymen have undertaken in that historic land, and which year by year they are striving to accomplish.

A Transformed Colony, Sierra Leone. By T. J. Alldridge, I.S.O., F.R.G.S. London: Seeley and Co., Ltd., 1910. *Price* 16*s. net.*

Mr. T. J. Alldridge joined the Colonial Civil Service so long ago as 1871, when he was sent to Sierra Leone on the west coast of Africa, and now at the conclusion of a long, useful and honourable career he sets before us his impressions of Sierra Leone as it was some forty years ago and as it is to-day. He is not a stranger to our readers, for, in 1901, he published an exceedingly interesting account of *Sherbro and its Hinterland*, which we reviewed in the May number of the Scottish Geographical Society's *Magazine* for 1902, and those of our readers who perused his first publication will extend a cordial welcome to his new book. The changes which have come over the colony during the period of his service have been remarkable, and happily afford good grounds for anticipating a peaceful and prosperous future in a region which, for centuries, might have been justly described as one of the darkest places in the Dark Continent. Mr. Alldridge himself says it is difficult to find language in which to convey adequately his own impressions of the changes, and now looking back on his long and arduous services he may take a legitimate pride in recalling his own part in bringing about so admirable a result. When he joined at Sierra Leone in 1871, possibly, and indeed probably, the most important factor in producing and maintaining disorder and misery was the hideous tyranny and misgovernment of the petty chiefs, in whose rule, character and actions it was impossible to find a redeeming feature. It was not till 1887 that the Freetown Government took the matter seriously in hand, and even then they were swayed more by the considerations of a dwindling trade than those of humanity for the oppressed inhabitants of the Hinterland. In this book Mr. Alldridge describes, with the graphic pen of an eyewitness and of one who took a prominent part in the proceedings, how the British Protectorate was formed: and he does ample and sympathetic justice to his colleague, Mr. Garrett, who shared with him the arduous, dangerous and delicate task of inducing the savage chiefs to accept the British suzerainty. This task successfully accomplished,

peace reigned in the land, and our readers can readily understand what changes for the better speedily ensued. To mention only one; the Government was able to construct a railway from the capital to Baiima within a few miles of the Liberian frontier, and to assist traffic by the construction of feeder roads, whereby country produce is brought to the capital and to the sea for export in much better condition, in much shorter time, and at much less expense than in former days. Great improvements have also been effected in Freetown and its vicinity. There is now a good water-supply and a well-equipped hospital and sanatorium. The period required for journeying between Freetown and England has been reduced from eighteen days to ten. The steamers employed are up-to-date in every respect and the number of passengers is largely increased. In the capital the establishment of telegraph offices, banks, the foreign money-order system and parcel post has greatly contributed to the increase and convenience of trade; but its character has changed. "The great firms of importers have gradually become their own middlemen, and while continuing to be wholesale merchants they have developed retail business on their own account. This is due not so much to local causes as to the changes in modern commerce and to the enormous pressure of competition in the European markets." In fact Freetown, with its municipal council, etc., now seems developing just like any other prosperous colonial city, but, up-to-date, it has not got either electric light or tramcars. But, if we may trust Mr. Alldridge, there may be a great future for the Hinterland, the healthiness of which is in marked contrast to the pestilential climate of Freetown. He anticipates a time when a Liverpool or Manchester man, wishing to combine business with pleasure, and "leaving the British fogs feeling rather more dead than alive," will start from Southampton and reach Baiima in less than a fortnight. Here he will be able to stay till April, combining, as we said, business with pleasure, and will lay in some "greatly improved health and with a stock of new ideas, some of which he may be able to turn to account for himself and the dusky people with whom he has passed the last few months." Some of the most interesting chapters of this book are those in which Mr. Alldridge sets before us what he has ascertained of the rites and ceremonies and objects of the strange secret societies, which, notwithstanding the advance of Christianity and civilisation, still flourish in the Protectorate. He evidently managed to insinuate himself into the good graces of the leaders of both male and female secret societies, for not only was he invited to witness some of their quaint ceremonies but also to photograph demons and neophytes of both sexes. "The whole of the Sierra Leone colony is professedly Christian," we are told, but, on the other hand, "fetish is still the most powerful agency at work in this part of Africa. Whether civilising influences will ever be able to dig down to the tap-root is one of those complex problems which only the future can solve; at present pagan and Mahommedan are alike enslaved by it, and even when the native professes Christianity it is very difficult for him to shake himself from its subtle and all-pervading influence." We heartily commend this book to our readers as a well-informed and interesting account of a comparatively little-known colony by one who is thoroughly qualified in every way to pronounce mature and well-balanced judgments on every phase of colonial life and progress. We must add that the numerous photographs are of exceptional value and interest, and there is also an excellent map of the colony compiled by the War Office.

Au Tchad. Par Capitaine Cornet. Paris: Plon, 1910. *Prix* 4 *francs.*

Lake Chad belongs to three European powers, viz., on the south to German Kamerun, on the south-west to British Northern Nigeria, and the remainder of

it to the French Sudan. In this volume the author describes the district surrounding the lake after three years' residence there, from 1904-1907. He sailed from France to the Congo and ascended to Brazzaville, the capital of French Congo, proceeding to Bangui by Kerno and up the Tomi to Krebeje. From here he rode to the river Gribingui, an affluent of the Shari, and sailed to Fort Archambault where he studied the habits of the pagan natives. Then he proceeded to Fort Lamy and sailed to Lake Chad in a whaleboat. The lake, he says, stretched like a sea to the horizon, and an east wind raised a storm which was followed by heavy rain. By desire of the native boatmen, honey and nuts were thrown into the lake to appease its evil spirits. Legions of mosquitoes added to our traveller's troubles. His boat was stopped by a fishing-net which, on being drawn up, was found to be full of fish, one weighing 30 lbs. Being under French protection, the natives inhabiting the French coast of the lake are now safe from the attacks of other tribes. Mao is the pretty capital of the French district of Kanem adjoining the lake, and near it is Bir Alali, where in 1900 the French routed the army of Rabah, the Egyptian invader, who was slain. Near here also they defeated both Senussi and Tuareg invaders.

Captain Cornet took part in an important military expedition to the Wadai country against a sheikh who had proved hostile to France. The author was nearly assagaied and his horse received a bullet. The enemy were defeated, and the expedition penetrated almost to Abeshe, the Wadai capital. Another military expedition took Captain Cornet against the Senussi of Borku and Ennedi. Although it was the "cold season" of March, the heat was intense, viz. 96° in the shade. This expedition routed a gang of slave-traders and liberated 100 slaves who were women and children, and who, the author says, "wept for joy on seeing themselves so miraculously delivered. Thus, Liberty is the happy ransom of all the blood shed." Another conflict under a burning sun led to the capture of the Senussi fort of Galakka.

The author says France must keep 200 soldiers in Borku and 200 in Tibesti in order to hold these outlying posts. He gives two sketch-maps and numerous illustrations, and his stirring story of military adventure shows what heavy blows France has been dealing at the African slave-trade.

The Land of the Lion. By W. S. Rainsford. London: Heinemann, 1909. *Price* 12*s.* 6*d. net.*

This attractive volume contains the author's notes of thirteen months' travel and sport in British East Africa. Although it must prove peculiarly fascinating and useful to "Big game" sportsmen, it contains much of geographical interest. For example, the author gives us one of the most unique maps ever prepared, a map showing those portions of the British East African Protectorate in which game is found, with the tracks of the author's travels. He also discusses with fulness the various forms of religion which have been offered in recent times to the African natives, and considers that the divisions between Christians "are a prime cause of our failure as missionaries. The present situation in the mission field the whole world over is ridiculous, deplorable, and pathetic." He acknowledges the immense good the Christian missionaries have accomplished and are to-day accomplishing. But he thinks they would succeed better if they brought "to these dark races, who are prepared to so love and follow them, a very much less complex, a quite simple religion." Meanwhile "Africa is becoming not Christian but Mohammedan, and it is becoming Mohammedan in spite of the immense advantage Christianity naturally has over the latter religion, owing to the fact that the rulers

of the land are Christians. Mohammedanism wins one hundred where Christianity wins one, because Mohammedanism gives the native what he can understand, what he wants, while it leaves him in possession of much that he is not willing to part with." There are numerous fine illustrations of sporting scenes.

AMERICA.

Le Brésil: Ses richesses naturelles, ses Industries. Tome I., 1909. Tome II., 1910. Paris: Librairie Aillaud et Cie.

These well-illustrated volumes, which are based upon a Brazilian official publication, have been issued with the object of spreading information about Brazil. They contain a large amount of information, much of it not readily obtainable elsewhere, and may be cordially recommended to the notice of geographers.

From so large a mass of material, space only permits us to pick out a few isolated points in order to give an idea of the contents of the book. Of special interest is the account of the important cultivated plants of Brazil. These are coffee, sugar-cane, cotton, cocoa, tobacco, with a number of minor plants, and full details are given in regard to all. Formerly wheat was grown with some success, especially in the mountain regions to the north. Now its cultivation is only attempted in the state of Parana. Rice is grown extensively, but owing to its practically universal use a large though diminishing amount is imported, chiefly from British India. Maize is also a very important cereal, which is widely grown and exported, though especially in certain years a considerable amount is also imported.

Very interesting is the account of the development of the industries of Brazil. In regard to most manufactured articles, the imports are only required to supply a relatively small part of the home demand, this being especially true of cotton goods, which are largely manufactured. Such articles as matches, boots and shoes, cigars, and so forth are manufactured almost in quantity sufficient to supply the home market. The United States is Brazil's best customer, but the British Empire supplies most of the imports, Germany coming next on the list.

En Haïti: Planteurs d'autrefois, Nègres d'aujourd'hui. Par Eugène Aubin. Paris: Librairie Armand Colin, 1910. *Prix 5 fr.*

The author presents in this volume the letters he wrote to the *Journal des Débats* during his residence in Hayti, which, he says, he travelled over more extensively than any white man (missionaries excepted) has done for a long time. Colonised by the French in the seventeenth century, Hayti was lost to France owing to the French Revolution, and its independence was declared on January 1st, 1804, after which a general massacre of the French took place, and Hayti is now a Negro republic. "On the ruins of the French colonisation, and with little thought of the government, a million and a half of negroes find themselves at present in possession of the ancient land of the whites, on which they live by the cultivation of their small holdings. They form, in the larger part of the country, a rural democracy surrounded by military police, having few wants, devoted equally to their priests and sorcerers, fixed to the soil by the articles of the Rural Code, accepting for horizon the limits of their parishes, and without desire to seek further either governors or judges. Many are well to do, most seem content. I do not believe that in the whole world there are happier or quieter negroes, provided politics do not disturb their affairs and revolution remains at a distance from their

dwellings." The negroes were originally introduced by the French from Western Africa, and were by law ordered to be "baptised and instructed in the Catholic Apostolic and Roman religion," to which they still nominally adhere with "an inevitable return to African origins," namely, fetishism or idolatry. "Christianity having come into contact with African religions, the negroes introduced a new divinity into their collection of deities, and admitted above and outside their traditional spirits, the supreme deity revealed by our doctrine. Gradually an intimate mixture occurred of Christianity and fetishism in which both beliefs reacted on each other in the manner in which the ancient paganism of the Slav continues to penetrate orthodox Christianity in certain parts of Eastern Europe."

The volume is well illustrated, and possesses two maps showing the author's travels between 1904 and 1906.

GENERAL.

A List of Geographical Atlases in the Library of Congress. Compiled under the direction of P. Lee Phillips, Chief, Division of Maps and Charts. 2 vols. On Sale by Superintendent of Documents. Government Printing Office, Washington, 1909. *Price* $2, 35 *cents.*

This useful work describes the 3470 geographical atlases in the collection of the U.S.A. Library of Congress. Its nature is sufficiently indicated by the explanatory leaflet which we quote. "Included in the collection are atlases of cities, those printed to accompany voyages, historical works, and scientific expeditions, and reproductions in atlases to accompany reports on boundary disputes between nations. The maps relating to America, and material of special interest not usually found in atlases, are brought to the attention of the student in bibliographical notes and contents.

"The book includes most of the well-known editions of Ptolemy, minutely described, and also many of the editions of Ortelius, Mercator, Blaeu, and the more recent atlases of the Italian, Dutch, French, German, and English schools. The American material describes most of the early atlases of this country and the various atlases relating to the early wars, and the state and county atlases of the United States.

"The prefatory note gives an analysis of the work and is followed by a full table of contents. Volume I. is devoted to the full descriptive titles of the collection; volume II. contains a complete authors' list of abridged titles giving full name of author, date of birth and death when known. This list is followed by a general index of over 40,000 references." The book will be found exceedingly useful for purposes of reference.

Greek (Modern) Self-taught. By Nicolaos Anastassiou.
Portuguese Self-taught. By E. da Cunha.
Marlborough's Self-taught Series. London: E. Marlborough and Co. *Price* 2*s.* 6*d. each.*

We have already reviewed here a number of other members of this series, and the present volumes possess in general the same features. In the case of the less-familiar Latin languages, such as Portuguese, we are disposed to think that more use might be made of comparisons with those more usually learnt, such as French, Spanish and Italian. It appeared to the reviewer during a recent actual use of the Portuguese volume in Portugal that such a comparison would render the task of the learner easier. Nor does there seem to us quite sufficient stress laid upon the nasal diphthongs, which to the stranger are such an unexpected feature of the

Portuguese tongue. Apart, however, from these minor points, the present books show all the excellent features of the series, and are well adapted for the use of the traveller.

Les Lois de la Géographie. By Carlos de Mello, Professor of Geography at San Paulo. Berlin: R. Friedländer und Sohn, 1902.

This book of 360 pages is divided into two quite distinct sections. Two-fifths of it is taken up with an exposition of the "laws" which give the book its title, the remainder with a bibliography of physical geography from Leibnitz to the present time. The section on laws is divided into two parts, one entitled, The present state of the question, the laws of terrestrial asymmetry; the other entitled, The laws of the mutual dependence of terrestrial forms. The work shows quite a remarkable amount of learning, but so far as we have examined it we cannot say that we have found in it anything very illuminating or interesting. The word "law" as used by Professor de Mello does not necessarily imply the detection of a cause, but is sometimes applied to a general statement comprising a great many instances, sometimes to a very comprehensive observation as to terrestrial distribution. The following may serve as examples. Lapparent, he tells us, has well summed up the observations on mountain chains in stating that nothing is rarer than a chain with both sides of the same slope, so that one may say that the fundamental law of terrestrial relief appears to be the dissymmetry of the slopes. "We will be more positive: we will say that this dissymmetry *is* the fundamental law of the morphology of the earth." As an example of his laws in the form of a very comprehensive statement as to terrestrial distribution we may take his "first law of contrasts," according to which "the solid and liquid masses of the globe, or, better, the continents and the oceans, are found in opposition round the axis of the lands (*l'axe des terres*)—the continental hemisphere to the north-east, the maritime hemisphere to the north-west." The author's account of "the axis of the lands" does not make this any less mysterious. He describes it as a great circle which coincides neither with the equator, the ecliptic, nor "the meridian," but one that makes an angle of about 42° with the equator (so far it is fairly intelligible), corresponding to a polar axis displaced by that amount to the north-east and south-west of the actual poles of the globe. To that we can attach no meaning. To make the position of his great circle intelligible he would have had to tell us at what meridians its nodes occur on the equator. The bibliography of physical geography is arranged under seven headings, under each of which the entries are according to the year of publication, and in each year in alphabetical order according to the authors' names. There is no index.

BOOKS RECEIVED.

The Siege and Conquest of the North Pole. By George Bryce, L.R.C.P. and S. (Edin.). Demy 8vo. Pp. xv + 334. *Price* 7*s.* 6*d.* London: Gibbings and Company, Ltd., 1910.

Colonsay, One of the Hebrides: Its Plants, their Local Names and Uses, Legends, Ruins, and Place-names, etc. By Murdoch M'Neill. Crown 8vo. Pp. x + 216. *Price* 3*s.* 6*d.* Edinburgh: David Douglas, 1910.

Physische Meereskunde. Von Prof. Dr. Gerhard Schott. Mit 39 Abbildungen (davon 8 lithograph. Tafeln). Zweite verbesserte Auflage. Cr. 12mo. Pp. 143. Leipzig: G. J. Göschen'sche Verlagshandlung, 1910.

. *Walks and People in Tuscany.* By Sir Francis Vane, Bart. With 16 Illustrations. Cr. 8vo. Pp. xv + 303. *Price* 5*s. net.* London : John Lane, 1910.

Man in many Lands: Being an Introduction to the Study of Geographical Control. By L. W. Lyde, M.A., F.R.G.S. Twenty-four full-page Illustrations in Colour. Cr. 8vo, cloth. Pp. vi + 183. *Price* 2*s.* 6*d.* London : A. and C. Black, 1910.

The Breezy Pentlands. By George M. Reith, M.A. Illustrated. Cr. 8vo. Pp. x + 180. *Price* 3*s.* 6*d.* Edinburgh : T. N. Foulis, 1910.

Guide-Annuaire de Madagascar et dépendances, Années 1909-10. Pp. 361. Demy 8vo. Madagascar, 1910.

Cook's Tourist's Handbook, Southern Italy (including Rome) and Sicily. With Maps and Plans. Cr. 8vo. Pp. xii + 388. *Price* 4*s.* London : Thos. Cook and Son, 1910.

Grieben's Guide-Books. Norway and Copenhagen. With 6 Maps. Pp. 149. Small 8vo. *Price* 3*s.* Berlin : Albert Goldschmidt, 1909-10.

Grieben's Guide-Books. The Rhine. With 7 Maps. Pp. 147. Small 8vo. *Price* 3*s. net.* Berlin : Albert Goldschmidt, 1910-11.

Grieben's Guide-Books. Dresden and Environs. With 3 Maps and 4 Ground-Plans. Pp. 90. Small 8vo. *Price* 1*s.* 6*d. net.* Berlin : Albert Goldschmidt, 1909-10.

Grieben's Guide-Books. The Lakes of Northern Italy, 1909-10. With 4 Maps. Pp. 153. Small 8vo. *Price* 3*s. net.* Berlin : Albert Goldschmidt, 1910-11.

On and off Duty in Annam. By Gabrielle M. Vassal. With numerous Illustrations from Photographs taken by the Author. Demy 8vo. Pp. xi + 283. *Price* 10*s. net.* London : Wm. Heinemann, 1910.

The Bernese Oberland. Vol. I. Part I. *From the Gemmi to the Mönchjoch.* Part II. *The Groups North and South of the Main Range. (Conway and Coolidge's Climbers' Guides.)* A New Edition. By W. A. B. Coolidge. 32mo. Pp. xxiv + 214. *Price* 10*s.* London : T. Fisher Unwin, 1910.

Traité de Géologie. II. *Les Périodes géologiques.* By Emile Haug. Fasciculé 2. Demy 8vo. Pp. 1396. *Prix* 10 *fr.* Paris : Librairie Armand Colin, 1910.

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By Loch and River : Being Memories of Loch Laggan and Upper Spey. By Thomas Sinton. Cr. 8vo. Pp. vii + 306. *Price* 4*s.* 6*d.* Inverness : The Northern Counties Newspaper and Printing and Publishing Co., Ltd., 1910.

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Maps and Map-making. Three Lectures delivered under the Auspices of the Royal Geographical Society. By E. A. Reeves, F.R.A.S., F.R.G.S. Demy 8vo. Pp. xiii + 145. *Price* 10*s. net.* London : Royal Geographical Society, 1910.

Hydrographic Surveying: Elementary. For Beginners, Seamen and Others. By Commander STUART MESSUM. With 262 Figures and 22 Plates. Demy 8vo. Pp. xiv + 504. *Price* 12*s. net.* London: Charles Griffin and Co., 1910.

La Catastrofe Sismica Calabro-Messinese. Par MARIO BARATTA. Illustrated. Maps and Plans. Demy 8vo. Pp. xii + 426. Roma: Società Geografica Italiana, 1910.

The Sportsman's and Tourist's Guide to the Rivers, Lochs, Moors, and Deer Forests of Scotland. Edited by J. WATSON LYALL. Cr. 8vo. Pp. lxii + 518. *Price* 1*s.* London: Lyall and Co., 1910.

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THE SCOTTISH

GEOGRAPHICAL

MAGAZINE.

ITALIAN EMIGRATION.

By V. Dingelstedt, Corresponding Member of the Royal Scottish Geographical Society.

The emigration, either permanent or temporary, of vast numbers of Italian workers has not only great national importance for Italy, but has also considerable international, political and economic interest, and no one would deny that it is of interest from a geographical point of view. A nation which sends a number of its children to work in regions outside of its own borders exercises a far greater influence in the world's affairs than one which is content to remain within its own political or national borders. It is in contact with people of different races and character, and living in manifold conditions of climate and physical environment it is able to develop to the full its particular genius and virtues. The Italians are the most migratory of all Latin races; they are truly cosmopolitan, and are called together with the Anglo-German race to people the world and to exercise a powerful mental and moral influence. An Italian statesman, Cesare Balbo, said some time ago that an excellent history of Italy might be made from the doings of Italians abroad. Since that time and especially since the *risorgimento*, that is the resurrection of Italians (or at least the greater part of them) to national unity and independence, emigration has shown extraordinary extension, and constitutes now one of the greatest, perhaps *the* greatest problem the statesmen of Italy have to face. The present writer desires to contribute to the elucidation of this problem so far as the space and material at his disposal may permit.

Introductory.—During last year the writer had the opportunity of studying in the pages of the *Magazine* (vol. xxv. p. 126) the emigration of the Swiss and its moral effects. Being now about to consider Italian emigration one might naturally inquire in what respects emigra-

tion differs in these two neighbouring states, and what are in these two cases the main motives which prompt the men to leave their beloved country to seek occupation abroad.

The Italians, though citizens of a country geographically more favoured, emigrate in relatively greater numbers than the Swiss. The latter, thanks to their ancient liberties and excellent schools, send abroad their teachers and skilled artisans, pushed rather by ambition than necessity, whereas the former send abroad many ignorant and very often unskilled workers, ready to accept all kinds even of the hardest, most perilous and unremunerative work. The Swiss do not interest themselves much in their emigrants, knowing them to be on the whole pretty well off, and, in consequence, the literature no less than the legislative and administrative enactments of the Swiss in regard to emigrants is but scanty. It is otherwise with the Italians going abroad to seek the work they do not find at home; they are more impulsive and also more ignorant, apt to be seduced by illusions and false prospects; they are more confiding and irresponsible, they want more tutelage and direction on the part of their government and the enlightened opinion of their country, and in consequence the literature upon Italian emigrants, the preoccupation of the public on their behalf, the legislative and administrative interference on their behalf is far greater in Italy than in Switzerland. The Italians were the first to organise a congress to debate the numerous problems connected with emigration. They have established in some schools, and in the associations for public instruction (popular universities) series of lectures with lantern views upon emigration. There are many official publications upon this subject, and some eminent Italian scholars and statesmen, such as P. Villari, Vincenzo Grossi, Conte Antonelli, D'Avarna di Gualtieri, Florenzano, E. Gontici, Jannone and many others, have written volumes of discussions, data and researches concerning emigration, and the possibility of establishing a closer connection between the emigrants and the people remaining at home. The deputies Ferrera, Turetti and Cobriani proposed to accord to the first some part in the government of their native country. According to the deputy Camillo Ferrera, the Italian emigrants may be considered as true modern helots, without civil rights, though bound by duties both towards the country they have left and the new country they have adopted. They cannot be naturalised without losing their citizenship in Italy, and it is asked why they should not have their representatives in the Italian Parliament.

Italians going abroad certainly render great and manifold service to the countries they settle in: they accomplish much hard and useful work, they establish almost everywhere their schools, and their moral and spiritual influence on other nations must be considered important. England did not escape this influence. Chaucer read, loved, imitated and translated Dante, Petrarch and Boccaccio. The great Elizabethans from Spenser and Shakespeare downwards were saturated with Italian influence, and the spell is strong in Milton. It had scarcely spent itself in letters when England fell under it again in the domain of arts. Many eminent Italians, insecure in their own country, have found a secure and respected asylum in England, and one of the greatest artisans of Italian

independence, Mazzini, found there many enthusiastic admirers and helpers, as for instance, Jessie White Mario, who is considered by Italians themselves as the Walkyrie of their successful revolution. The society founded in London by Mazzini—"Friends of Italy"—for long enjoyed the support of Lord Shaftesbury and a number of other eminent English men and women.

Italian workmen are of very great importance for the civilisation of Europe, for they undertake and execute with accomplished skill the most difficult works, such as the piercing of mountain tunnels, the construction of bridges and railways, the digging of canals and the erection of buildings, which are so essential for modern comfort. The cities of Switzerland and its magnificent hotels in the plain and on the summits of the high mountains, its tunnels and railways, which bring so many millions to the Swiss tourist industry (*Industrie des étrangers*) and make of Switzerland the meeting-place of Europe and America, are the work of Italians, who have made them, exposing their very life to a thousand dangers, for a very modest remuneration. The same may be said with but little modification of some parts of France and Germany, where, as for instance in the mineral districts of Alsace and Lorraine, as also in the region of Lyons for the silk and glass industries, the Italian workman occupies a very conspicuous place. Italian labour in Latin America as well as in the United States is also of a very high importance.

Italian immigration is not, however, viewed everywhere with equal favour: the Italians, like other men, have both serious and slight defects, and even virtues, which have not the gift of pleasing everybody. They may work sometimes at lower wages than other people, they are sober, and they save part of the money they get to aid their families at home. They are also not much liked by police and authorities on account of being troublesome, inclined to violence, strikes, and disrespect of law and order. Some of them are very poor, miserable, drunken and lazy. They tax heavily the local beneficent institutions, and profit largely at the expense of the indigenous race from gifts given to alleviate the sufferings of the poor. The Italians abroad live in more or less large, segregated groups bound together by their common interests, having in everything their own ways, their boarding-houses, their bars, their inns, their schools, their newspapers, their pleasures, their quarters. They do not associate much with the people of the country they live in, they do not learn either the language of the people, nor the local economic or geographical conditions of their new home; very ignorant, strangers among strangers, they do little to make themselves sympathetic to the natives and do not always present themselves to the last as a model of moral life worthy of imitation.

The Italian emigrants contribute to the increase of crimes, often of a violent and passionate character, perpetrated mostly among Italians themselves. The "Black Hand," for instance, is the terror of Italian colonies in New York, Philadelphia, Boston and Pittsburg. It is a gang of individual blackmailers working in groups and using the sign of a black hand. Their practice of bomb-throwing, arson, and assassination in the Italian quarter of New York have long made them the despair of police com-

missioners and a terror to peaceful citizens. Happily, however, the latter are in their turn beginning to stir and to organise a counter-society of the "White Hand." According to Sir Harry Johnston, the crimes among the Italian settlers in Alabama, Mississippi, and Louisiana are proportionately more frequent than even among the negro population of these countries. The Italians are also not seldom daring smugglers, as is, for instance, the case on the Ticino-Italian frontier, where the objects of their exploits are sugar, tobacco, chocolate, and naphtha.

One may hear other complaints about Italian colonists, but all this does not impair their sterling qualities, and must be mainly ascribed to the cruel conditions, sufferings, privations, insecurity, injustice, rigours of climate the poor Italians are subject to amidst a foreign population, on leaving their beautiful country in search of work and living under foreign laws, and in an unaccustomed environment.

Besides, it is only of recent years that the government in Italy has begun to interest itself a little more seriously in the fate of its numerous population beyond the frontiers. In order to guide and to protect the emigrants, the "Istituto Coloniale Italiano" has been created, at the head of which is placed a high commissioner (commissario), and a central commission of emigration (commissariate) directed by the minister of foreign affairs, and a board or council composed of representatives of the home, treasury, naval, educational and agricultural departments, as well as of a geographer, a statistician, an economist, a member from the co-operative societies, and another from the principal charitable societies. Besides this central authority, at all the principal ports of Italy inspectors, and committees whose members are chosen from the districts of most active emigration, are appointed: there are also provincial secretaries for emigration, *addetti* or functionaries who may be consulted, and travelling inspectors abroad. The law provides that only licensed agents may sell a ticket to an intending emigrant at a fixed price. These agents are forbidden to incite to emigration and to receive anything beyond the passage money, which must be returned if the intending emigrant is prevented from going by illness. The agents have to provide food and lodging if the emigrants are detained by quarantine or shipwreck, and to compensate those emigrants who are rejected. There is now being discussed in parliament a project of a law for emigration elaborated by Mr. Tittoni. The Istituto Coloniale disposes of a fund of about four millions, and the annual expenses for subsidies and patronage reach a sum of about two millions. Besides the government, considerable private initiative has manifested itself recently in order to preserve in colonies virtues proper to Italy, under the term of "Italianity." Nothing is more natural on the part of such a gifted nation as the Italians, having conquered at last, after long and heroic struggle, political unity and independence for at least the majority of its children, than the tendency to defend and conserve their national spirit, their language and customs, in face of so many dangers which menace those precious gifts among foreign people and surroundings. Just as personal liberty is the basis of individual development, so the preservation of national characteristics may be considered a necessary condition for the progress of a nation along the line of least resistance. Many

efforts are made now for the defence and preservation of "Italianity," and for that purpose the Dante Alighieri Society was founded twenty years ago, and already numbers some fifty thousand members. It held its last congress in autumn 1909 at Brescia. Its means of action is the creation and subsidy of schools, libraries, clubs, organisation of lectures, charitable institutions, and the defence and maintenance of the Italian language among Italians dispersed in the world. There is in parliament at present an outstanding project of Mr. Tittoni's in regard to Italian schools abroad with a view to their better management and the raising of the salaries of teachers. The Mediterranean schools will belong to the government, whilst the schools beyond the seas will be subsidised. All those schools, whilst following the curriculum of the home schools, will have to adapt themselves to local conditions. In order to settle all didactic and disciplinary questions connected with Italian schools abroad, it is proposed to attach a central commission to the foreign ministry. At the present time the Italians have to maintain abroad about five hundred schools, all primary. But most of these are very poor, and from the small sum at the disposal of the government (about one million lire) some of them get an entirely ludicrous subsidy of some fifty to sixty lire a year.

Statistics.—The number of Italian emigrants across the sea was small at the time of the Italian resurrection in 1859; but it has begun to increase in an alarming manner since the happy time when, after heroic struggles and great efforts, the Italians obtained at last their national and political unity and became one of the Great Powers of the world. In 1876 there were a little above 100,000 emigrants annually. This number had doubled in the next years; and in 1896 there were already 300,000 emigrants annually. In the six years from 1894 to 1899 one and three-quarters of a million of Italians left their native shores, and about one million of them crossed the ocean, going mainly to Brazil (372,600), United States (289,536), and Uruguay and Paraguay (257,550). At the beginning of the present century, the number of Italians abroad was calculated at about two millions. Since then this formidable movement is steadily increasing. In the first three years of the twentieth century it was above half a million annually; in 1905 the number had reached three-quarters of a million; in the year 1906 the total number of emigrants was as high as 787,977, and only very little beneath it in 1907, when, according to official statistics, 574,432 men, 130,273 women, and 72,237 children under the age of fifteen, left Italy. About 40 per cent. of them went to the continent of Europe, the other 60 per cent. sailed for America. These numbers are rather beneath the truth, for there are always a certain number of clandestine emigrants, not accepted on the ships on account of pellagra and other reasons. Among the emigrants in 1907 there were about 34 per cent. agriculturists and shepherds, about 30 per cent. navvies, builders, and unskilled labourers (giornalieri), 13 per cent. miners and operatives, 12 per cent. masons, bricklayers, sculptors, and other artisans. The proportion of the emigrants to the rest of the population has increased in the following formidable way. For every 10,000 inhabitants—

Years 1876-78,	81	emigrants, of whom		5	crossed the ocean.
1886-88,	547	,,	,,	489	,,
1896-98,	831	,,	,,	763	,,
1899-1901,	1287	,,	,,	1147	,,
1902-04,	1817	,,	,,	1577	,,
1905-07,	2757	,,	,,	2531	,,

Happily there is also a contrary movement of repatriation. In 1906 the numbers of those who returned home after a longer or shorter absence abroad was calculated at 174,949; in 1907 at 248,979. The emigration is thus to be distinguished as permanent, temporary, and semi-temporary, that is, when the absence from the native home is prolonged for years.

The temporary emigration is directed from Milan to Switzerland (mainly to Ticino, Zürich, Vaud, Geneva, and Valais); to Germany and to Austria-Hungary. These emigrants, mainly from North and South Italy, start usually at the beginning of the spring and return home at the end of the autumn; sometimes, if there is winter work, they do not come home for some years. The semi-temporary emigrants embark for America for five or six years, with the idea of getting money, some thousand lire, and then returning home to buy a field and to build up a farm. By far the greatest number of emigrants go, however, to the United States, Argentina, Brazil, Central America, mainly from South Italy—especially Calabria, Basilicata, Sicilia.

There have emigrated into Argentina—

In 1902,	32,000
1903,	40,581
1904,	59,964
1905,	86,346
1906,	114,818
1907,	86,649
The first four months of 1908,	14,169
Total,	434,517

There is now going on a species of collective emigrations *en masse* of whole villages with a parish priest at the head. According to Professor Boser, in the ten years from 1896 emigration from South Italy had grown threefold, and had attained the figure of 180 persons for each 10,000 inhabitants. The already thinly populated Basilicata has seen its numbers, in some provinces, decrease by about 40 per cent. (from 11,600 to 6000 in Marsico Nuovo, and from 6400 to 2500 in Pignola) in consequence of emigration. The greatest number of permanent emigrants come from Campania, Abruzzi, and Molise, and Sicilia, Basilicata, and Calabria: the greatest number of temporary emigrants come from Venetia, Emilia, Piedmont, and Tuscany. Of the total number of yearly emigrants, a little above half return.

The oversea emigrants are conveyed partly by Italian and partly by foreign ships. The main Italian ports are Genoa and Naples, and Italian

vessels are taking a more and more prominent part in the transport of emigrants. In 1902 the ratio of the national and foreign movement of ships was as 4170 to 5830; in 1907 this ratio was as 5210 to 4790. The expenditure of Italian emigrants for their conveyance in foreign ships has been calculated as high as sixty million lire.

Italian Colonies.—The Italian workers go almost everywhere where work is to be done, mostly as masons, navvies, agriculturists and unskilled labourers, but the region of their expansion is limited by their objection to cold climates, and also naturally by the state of the labour market. They do not go much to Russia, nor to the Scandinavian countries, and they are not seen in South Africa. In Europe they go mainly to Switzerland, France, Germany, and in smaller numbers to Austria-Hungary, the Balkan Peninsula and the Mediterranean countries —Turkey, Egypt, Tripoli. Their most numerous colonies over the ocean are in the United States, Argentina, and Brazil. The current of emigration to Canada is but small—about ten thousand yearly.

For the emigration directed towards the European Continent, the principal meeting-place and starting-point is Milan, where, thanks to the liberality of a Milanese patrician of the Doria family and the devotion of many generous citizens, especially Monsignor Bonomelli, every accommodation is organised for intending emigrants at most moderate prices. There are also many workshops in which those who cannot be immediately engaged for work abroad may find remunerative occupation for three weeks. In Milan the emigrants can obtain all necessary information concerning the state of the labour market, and they are directed, under the patronage of the "Humanitarian Society," *via* Chiasso, or Domodossola, to the place where they can find work.

The Italians find generally sufficient work in Switzerland. Their number in the warm season is estimated at about one hundred and ninety thousand. Many have established themselves definitely, but the majority return home to Italy for the winter. They have their schools, their newspapers, their inns, their organisations, their chiefs, etc. They are not specially protected by Swiss laws, whose protection extends mainly to the workers in covered establishments, while the Italians work usually in the open air. They are at the head of socialistic movements, tend steadily to improve their situation and increase their wages, and are always disposed to organise strikes, sometimes with good results, but often not.

We cannot, of course, follow the emigrants everywhere, nor present to the reader the varied conditions in which they are called to work under foreign laws. But we may mention two important groups of Italian workers in France and Germany, viz., the mining district of Alsace and Lorraine centred about Metz, and the manufacturing district of Lyons where silk and glass wares are manufactured. Each of these two great labour markets employs about ninety thousand Italians—men, women and children. They are certainly paid for their work, but they are scarcely protected against exploitation. They live huddled together in a most communistic manner; they make their girls and boys work together, and their morals, as described by such competent authorities

as the acting secretary for emigration for Tuscany, Capitan Valentino, are deplorable.

The most important Italian colonies over the ocean, as already stated, are in the United States, Argentina and Brazil. But it must be at once acknowledged that the actual importance of those colonies for Italy, either in America or in the Mediterranean basin, does not correspond to the considerable numbers of Italians they contain. The number alone of workers nowadays, in the universal competition for fortune in the regions of the world promising the greatest profit, though certainly important, yet is not sufficient to assure to one particular nation a benefit corresponding to its output in labour. There are necessary, besides, enterprise, money, and last, but not least, diplomatic pressure, political ability, and conventions with the governments concerned. It may very well be that the actual importance of the Italian colonies in the countries just mentioned depends less on the numbers of Italians toiling therein, than on the situation of Italy in Europe, and the strength and the credit it enjoys. Buenos Aires, like Rio de Janeiro, and like Alexandria, are industrial and commercial centres founded properly by Europe at large, where preponderance is assured not to those European natives who have there the greatest number of their countrymen, but to those who have best-developed industries, possess the greatest credit, and are more enterprising, more cultured, and enjoy the most efficient political support from their respective governments. It may be that Italy is as yet not quite awake to the grave duties imposed on her by so great a number of her children obliged to seek work outside her frontiers. But that is not to say that the important question of Italian emigration does not occupy the government or public opinion, for the question is treated frequently in the press. The Italians want above all more money. As an illustration of the poverty of some, even of the most important Italian colonies, may be cited an instance given by Enrico Corradini in *Il Marzocco* (17th November 1909). In San Paolo in Brazil the Italian colony was in dire want of a secondary school. The need is recognised by all, but they cannot succeed in getting the necessary sum of about twelve thousand pounds. Happily an agreement has been reached recently between the French and Italians for the establishment of the "Banque Française et Italienne pour l'Amérique du Sud."

The *United States* constitute now for Italians the main point of attraction. Once it was Britons, Germans, and Scandinavians who emigrated to the United States, now it is Magyars, Italians, Russians, and Finlanders who constitute the bulk of immigrants. According to the estimate of the "commissariati" for emigration, the numbers of Italian emigrants to the United States increased in 1905 and 1906 from 241,143 to 284,039. From the 1st July 1906 to 30th June 1907, 285,700 emigrants went to this country, being a little above 22 per cent. of the total number of immigrants in this period of time (1,285,349).

It is mostly a sad story that of Italian emigration to the United States. Certainly the Italians get money for their work and ability, but at what a fearful sacrifice. By far the greatest number of Italians going

to the United States come from the south of the peninsula and from Sicily. Out of the number of Italian emigrants just mentioned, 237,680 were from the South, and only 47,800 from the North. Most do not go into the interior of the country or to the Far West, but stop at New York. In 1904 they constituted already in this city a colony of 400,000—that is almost as many as in the capital of Italy itself, and since that time their numbers have increased. According to Dr. Stella, surgeon at the New York Hospital, only one-fifth of these immigrants may be considered as well-to-do. They possess property estimated at thirty to forty million dollars. The rest live miserably, executing the hardest and lowest type of work for a daily wage of one or one and a half dollars. This is hardly sufficient to live tolerably in the great city, but to save money for their homes the Italians submit to every kind of privation, eat badly, lodge yet worse, sometimes three or four persons in a dark room. And these conditions exercise the most deplorable effect, as Italians in their own country are accustomed to work in the open air. Anæmia, nephritis, bronchitis, and especially tuberculosis, make in consequence numbers of victims among them (Dr. Stella, *Gl' Italiani negli Stati Uniti d'America*, New York, 1906). The Italian Government certainly endeavours to protect its subjects from abuse on the part of Americans who seek to profit by their inexperience and embarrassments. The New York Commissioners have succeeded recently in establishing at the Battery a "Casa per gli Italiani," where the immigrants may obtain board for half a dollar a day, but how many there are who cannot afford this moderate sum. According to Luigi Villari, the former Italian Consul in Philadelphia, there are in New York in the Italian quarters 360,000 inhabited rooms without a window. Certainly there are other parts of the United States where the Italians are better off than in New York. They work in Louisiana in the plantations along with the black people. Some thousand families of them are engaged in Florida on the vast property belonging to the Royal Duke Litta, Visconti Arese.

Italian immigration into America may be considered as an important factor in human development, for the high moral and intellectual standard characteristic of this classical, idealistic, and artistic nation should mitigate the too material tendency of American civilisation, with its exaggerated notion of the value of money.

Argentina.—The numbers of Italians who have emigrated to Argentina was calculated at 1,331,536 from 1857 up to 1903, that is above 61 per cent. of the total number of European emigrants to this country for the indicated period of forty-five years. Since then the flow of Italian emigration has continued uninterrupted, and even with increasing strength. The numbers of Italians who have embarked for Argentina during the last seven years (1903-10) may be calculated as high as half a million, including mostly non agricultural labourers, attracted by the extensive works and industrial enterprises. An excellent account of the vast possibilities and the economic expansion of Argentina, given in the twenty-fifth volume of this *Magazine*, explains well such a rush from a country whose inhabitants need work. Most of the Italian immigrants converge

towards Buenos Aires and its harbour and thus increase its proletariat. Italians with Spaniards constitute above four-fifths of the total number of immigrants. According to the estimate of Signor Tomezzoli (inspector of the Italian committee for emigration) 24 per cent. of the immigrants remain in the capital, which includes within its limits almost one-fifth of the total population of the vast republic, four times as great as France. In Buenos Aires gather all the ruined and disheartened immigrants together with the landlords enriched by speculation or by the land. The older inhabitants go more to the west and south-west to open up the virgin lands, and abandon the littoral to the newcomers. The great facilities for transport have brought Argentina so near to Italy that some Italian labourers find it possible to go to Argentina for the harvest and return for the harvest at home the same year. It is, however, only just to acknowledge that Argentina owes most of its agricultural and commercial prosperity to Italians, who some twenty years ago opened up this now rich but formerly so little known country. They were its first indefatigable pioneers, and have almost alone, with the greatest difficulties, by hard labour, sobriety and perseverance, engaged in the struggle with wild Nature. With their labour, though but with little money, they opened up a country which has now become one of the granaries of the world.

Brazil.—The Italians began to colonise this vast country in 1874-76, some time after the Germans, who established their first colonies in the southern part of the republic in 1820-30. At first Italian emigration to Brazil was moderate; in ten years (1877-86) 113,628 persons[1] emigrated in all; but in 1887, and especially during the next year, which was the year of the final abolition of slavery in the country, Italian emigration grew to alarming dimensions, which has experienced, however, a diminution during the last few years. It is calculated that during the last twenty years above one million Italians have gone to Brazil, twice as many as even Portuguese. During the last twenty years Italian emigrants to Brazil were as numerous as the European emigrants of all other nationalities to the country. Out of the twenty united states of Brazil it is the state of São Paulo which attracts by far the greatest number of Italian as also of other emigrants. Next to it come Bahia and Rio Grande do Sul; six other states, viz. Pernambuco, Rio de Janeiro, S. Catharina, Minas Geraes, Espirito-Santo, and Maranhão, have relatively small numbers of Italian or of other immigrants, whilst the remaining states have none at all.

Brazil is ethnically a very heterogeneous country, and its sole chance of acquiring unity in this important respect lies in the numerical preponderance of Italians, who cross frequently with the indigenous element (*sertanista*). This permits us to expect that in the future there may be constituted a Brazilian race capable of yielding the necessary national unity. From 1827 up to 1901 the state of S. Paulo alone has received one million emigrants, of whom 770,000 were Italians.[2] In

[1] V. Grossi, *Storia della Colonizzazione europea al Brasile*. Roma, 1905.

[2] Unfortunately the Italians are divided into groups of Piedmontese, Venetians, Calabrians, Sicilians, etc., each speaking their own dialect, and in consequence they speedily learn Portuguese, in order to facilitate communication with each other.

1902, 28,895 more Italian immigrants arrived in this ancient state: in 1903, 9444. This considerable decrease in the numbers of Italian immigrants has come about in consequence of the decree of Prinetti which abolished gratuitous transport over the sea. In 1904 the number of Italian immigrants continued to decrease. The Italian element in the state of S. Paulo predominates along the railway of the company *Paulista*, and around the great centres of coffee production on the railway of *Mogyana*. In decreasing numbers the Italians are also found established along the lines of the Central and Sorocabana railways. The majority of the Italians are agriculturists, lodged in private *fazendas* as paid hands according to a compact concluded with the proprietors of the coffee plantations. The usual wages are 80,000 reis for the annual cultivation of 1000 plants of coffee, and 500 reis for every 50 litres of coffee loaded into cars. A colonist takes charge of about 5000 bushes of coffee, maintaining them in good order in every respect, collecting the ripe grains and preparing the soil. The almost exclusive cultivation of coffee produces commercial crises, which, as for instance at the end of 1896, have a great effect on the welfare of the colonists. Immigration decreases with the decrease in the price of coffee. The agricultural crises from which Brazil suffers are mainly the consequence of the fact that, whilst the commerce of agricultural products has become "mondial," the organisation of agricultural labour has retained its regional or local character. There are great fluctuations in the distribution of immigrants among different states, this distribution depending greatly on the actual state of the labour market and the success of the crops. To attach the immigrant more firmly to the region once chosen it is necessary to give him more rights and more chance of becoming a true citizen of the country chosen as his new home.

The case of Italian emigration to Brazil illustrates forcibly what we have advanced before concerning the inadequacy of numbers to win for the Italian colonies the degree of importance to which otherwise they are entitled. Very instructive in this respect is the comparison made by Professor Vincenzo Grossi in his paper printed in the *Rivista Marittima*, 1904, in regard to the relative situation in Brazil of German and Italian colonies. The Italian colonies are far more numerous than the German ones: but in spite of their number, the Italian colonies are decidedly inferior to the German from the economic, financial, and administrative points of view, as well also in respect of the political, commercial, and moral relations of those colonies with their respective mother countries. The reasons for this, as explained by the author, must be ascribed to the peculiar genius of the Italians: bold in enterprise, persevering in labour and in saving, they are badly fitted for forming associations and corporations, and though prosperous in Rio Grande do Sul, as in some other states, they have not been able, like the Germans, to form a collectivity living a corporate life. Another eminent Italian, Conto Antonelli, has acknowledged that in spite of their spirit of industry the Italians lack the gift which allows the giving of a rational direction to a common effort. The Germans also know better how to develop their mercantile marine to aid the needs of their colonies; they have opened many new lines of

navigation with some initial risk, and they have managed to oblige some Italian merchants to communicate with their colonies in Brazil *via* Hamburg, to the great damage of Italian commerce.

The Italian Government is endeavouring, however, to do what it can with the small means at its disposal. It has its "Patronati," to which it gives a subsidy of about 80,000 lire, its "Maestri-agenti," its "Medici-agenti," an inspector, and so forth.

Causes and effects of Italian emigration.—The density of population in Italy is only 290 per square mile. It might seem very strange that these lovely coasts with their beautiful climate, which have attracted from immemorial times civilised and barbarians from all the less favoured parts of the world, and still continue to attract millions of foreigners, should be deserted by their own inhabitants, and that precisely after secular efforts, at last crowned with success, to attain political unity and independence. The fact seems yet more stupendous when we consider that Italians are highly patriotic: they love their country and their home above everything in the world, and they have so many touching expressions of their deep attachment. *Casa mia, mamma mia. Legami mani e piedi e gettami tra' miei.* Those and many other similar popular sayings seem to indicate clearly that Italians love their country dearly, and besides, they prove it not only by sayings but yet better by facts: on going abroad they send most of the money won by hard labour and privations home. According to Professor Villari (*Scritti sulla Emigrazione*) the remittances of emigrants are estimated at 35 million francs per year. In his inaugural address at the meeting of the London branch of our Society in April 1892, Professor James Bryce affirmed that Food, War, and Labour were the three main causes which prompt men to change their home.

Food and Labour go certainly far to oblige the Italians to emigrate, but there are other powerful causes which prompt them to leave their beautiful country. The peasants are certainly very badly off. How dreadful is their poverty may be judged from the statements of excellent authorities. In Calabria and in many other parts of South Italy the country people are huddled in deserted and desolated rural boroughs, suspended upon dreary rocks. Many of the town people are also poor. One may see in Naples four families living in the four corners of the same room, without beds. There are about 100,000 people who live in this squalor under atrocious conditions.[1] The picture of poverty described also by Professor Villari[2] is appalling. The Italians, most favoured of nations under their blue sky, are poorer than the Swiss in their inhospitable regions amidst glaciers and snow. The foreign yoke, the cruel oppression, the numbing influence of the Roman Church, the heavy taxes, bad administration, have all together and separately played their evil part in impoverishing the country, naturally so rich, and certainly they continue to exercise their deplorable action. But since already for half a century modern Italy has rejoiced in all the blessings of freedom and an enlightened constitutional government, why then does the Italian still

[1] Monzilli, *Italia Moderna*. [2] *Scritti sulla Emigrazione*.

continue to suffer from poverty to such a degree as to find himself obliged to leave his beautiful country and to emigrate to less congenial climates to win his bread by painful work? One of the reasons is that there are as yet few industries and much ignorance. Half a century is not a very long period in the life of a nation, and yet in this brief period of time the Italians have made wonderful progress: they have placed their finances on a sound footing: in the north of the peninsula, they have very considerably developed their industries, they have taken an active part in numerous scientific discoveries, they have won more self-confidence. And yet, it is precisely since their emancipation or *risorgimento* that Italians have begun to leave their country in great numbers; it is as if the energies now no more necessary for the attainment of unity and independence have taken another direction, in the search for useful and remunerative work all over the world. Italian emigration may be thus not a sign of poverty, but on the contrary the sign of pent up energy, which does not find applications at home; it is a sign of discontent, which has become one of the most characteristic phenomena of the present social movement in the working classes all the world over, a sign also of the increasing spirit of adventure and enterprise. From this point of view Italian emigration is more easily explained.

There are certainly very poor provinces in Southern Italy, but they have not grown poorer since the times of Bourbon and Papal domination. As to discontent it is otherwise; it has grown immensely, and discontent is often a sign of progress and increasing ambition. Notwithstanding the very considerable progress that united Italy has accomplished during the last fifty years, the Italians have not mastered as yet the highly difficult problem of increasing the prosperity of the southern provinces and of the two great Italian isles, and they have not as yet found the means of accomplishing the necessary land reform on a sound basis. The legislative and well-to-do classes have not as yet made the necessary efforts to raise the social and economic conditions of the poor and to fill up the social abyss that separates the two classes. The sense of patriotism has partly gone with many of the poor workers, obliged to seek their bread abroad. "Do you love Italy?" asked Senator Villari of some of the workers at Goeschenen. "Italy is to us the country which gives us bread," answered the workers, laughing. "Are you Italians?" continued the interrogator. "We were born in Italy, but we are not Italians because we have been obliged to seek our bread abroad."[1] The poor are crushed by heavy taxes, and the thousand promises made by the government to alleviate them remain promises. Contrary to what has been done in Switzerland, the poor people in Italy have not been brought to participate in communal and municipal affairs and deliberations. The Italian councils retain a rather oligarchic character, and besides it is a great misfortune for Italy that it has never known how to develop country life, and has centred all interests in the boroughs. There are many minor causes that have contributed to increase emigration. There are few or no industries in the south fitted to occupy the winter. The

[1] P. Villari, *Scritti sulla Emigrazione.* Bologna.

silkworm disease which made its appearance in 1850 has almost ruined the old and once prosperous industry of sericulture. The young and very ignorant people are allured by the prospect of living in company with their friends who have already departed, far from the surveillance of the old people and from family cares, and with a prospect of making money. Some of the theories about crime made popular by Lombroso may possibly also have contributed to urge on emigration, for according to those theories the criminal may become virtuous and orderly by simply changing his environment.

There is at present an intense desire among patriotic Italians to investigate the causes of such an alarming social phenomenon as depopulation by an exodus of natives from the most beautiful regions of Italy into foreign lands. It may be also that the ignorance of the conditions prevailing in these, in consequence of the astonishing neglect in which the study of geography is left in Italy, is partly answerable for the errors committed by the emigrants.

The effects of Italian emigration are vast and widespread. They interest not only Italy but the world at large. They are already much discussed, and are certainly partly beneficial, partly mischievous. They deserve to attract the further attention of statesmen and the public. We will consider first the beneficial effects of Italian emigration, and mention before all the truly gigantic work accomplished by Italians for the benefit of the whole of humanity in piercing high mountains, in digging navigable canals, in constructing roads and buildings. Modern comfort owes much to the rude Italian mason, ploughman, and navvy, who accept the hardest work. But the Italians are highly fitted not only for manual labour; the civilised world owes also to the Italians abroad a great debt of gratitude for many spiritual delights due to their incomparable art, their efficiency in music, sculpture, architecture, painting, science and mechanics. The main benefit of the emigration for Italy consists in the amount of money the Italians are getting abroad for their work, a considerable part of which they send to their near relatives who have remained at home. This money contributes considerably to ameliorate the situation of poor families in many districts. Besides, the fortunate emigrants do not only send money home to help their parents, but after some years of successful work they return home with their money themselves, buy a piece of land, construct a house and continue to work, thus contributing to the welfare of the whole community.

In Turrito, a province of Taranto, about four thousand emigrants have returned to buy land and construct farms. This fact produces in some southern provinces of Italy an astonishing economic transformation. The former petty landlords of those provinces, who till lately lived in laziness on their estates, spending their time in taverns, whilst squeezing their tenants, are gradually being replaced by emigrants returned home with fortunes made, and animated with quite another spirit of useful activity.

With extended emigration popular instruction has also benefited, for the intending emigrant appreciates the value of knowledge. Usury seems also on the road to disappear. Emigration from agricultural

regions has also indirectly contributed to the rise of wages for the labourers remaining at home, though this has been accompanied by a rise in the price of food. There may be other beneficial effects, such as usually accompany travel and knowledge of the world; for instance, better opportunities for developing one's faculties in the vast camp of universal competition. There are not a few Italian publicists who consider emigration rather as a boon for their mother country.

It is to be feared, however, that the bad effects of Italian emigration, at least for Italy, outweigh its advantages. The regions whence the emigration proceeds are depopulated, for it is the strongest and ablest who go, the weak, the old and incapable remain; the land does not retain sufficient numbers of labourers, and the small landlords see themselves obliged to abandon cultivation, or engage workers from distant provinces such as Lombardy and Romagna at higher and ruinous wages. Large tracts of land are passing out of cultivation. Many of the people left behind are kept from starving only by the help of those who have gone to work abroad. The whole rural life of the country feels the need of workers. The former summer displacement of the alpine and subalpine population towards the rich Po valley has changed its current; the mountain population prefers now to direct its steps abroad. With the coming of the spring the people disperse to Switzerland, France, Austria, and Germany. From the hills dominating Brescia, for instance, the people no longer descend as in former years, or only in very decreased numbers, to rear the silkworm in the plains of Lombardy. They prefer to go abroad. Similarly the population of Abruzzi used to descend formerly at the beginning of the season to the Roman plains for field work, now they go abroad, and the landlords of Latium are without hands. The same thing occurs almost everywhere. The people of Basilicata usually furnished their contingent of workers to the plains of the Campania, now they have mostly deserted their native country, have emigrated to the United States, and the Campaniards are obliged to engage workers from distant Apulia. The plains of Basilicata itself now need workers from elsewhere. Formerly there was a great displacement of agricultural workers in the interior of Italy at harvest time; from 200,000 to 400,000 labourers moved from one place to another in search of work, now this movement has mainly taken the direction abroad, to the great prejudice of national agriculture.

There is besides another evil. A number of emigrants beyond the ocean succeed after hard toil in the mines, or the railways, in the tunnels, and hard privations of every kind, in saving a sum of money, say some £400 to £500. They then return to their native homes, and if not ruined in health, they buy at double or triple its real value some piece of land from its former landlord, and construct a house, and seem happy. But the happiness is ephemeral. Ignorant of the rational culture of land, and having paid too high a price, the little property soon becomes exhausted, and the owner finds how difficult it is to get a living on the land and to sustain competition. If a bad season occurs he falls into debt, and sometimes even before he has completed the construction of his hovel he sees the necessity of emigrating again to

seek work abroad. If he succumbs, his small property, badly secured, divided between his children, loses much of its value and becomes incapable of resisting the weight of the taxes. There are other mischiefs consequent on emigration. The young men who set out emancipate themselves too early from family ties and the surveillance of their elders. According to Antonio Mongano (*Nuova Antologia*, 1st September 1907) there are many Italians in America who have two wives, one in Italy and another in America. Women left by the emigrant at home have a hard life and are often ruined. The dismemberment of families has grave moral consequences for all, and especially for the children: family discipline goes to the winds. If the emigrant gets money he gets also vices unknown to him before; if some part of the money won abroad is employed to buy land, the other part serves for merrymaking and debauch. Alcoholism makes great strides, and syphilis, almost unknown thirty years ago, has become widely spread (P. Villari, *Scritti sulla Emigrazione*). In many provinces (Udine, Belluno, Cadore), not only men but also women take to drink; the countrywomen on Sundays enter the public-house before Mass, ask for a quinto of brandy, soak in it their piece of bread and drink it as if it were coffee or milk. The commune of Cadore (in Belluno) with its 4093 inhabitants, consumes 30,000 lire worth of brandy. One can easily imagine that alcoholism does not produce any good effect. The cases of mental aberration are on the increase, whilst the number of strong, healthy, active men and women is decreasing. Left alone without their menfolk, the countrywomen have to execute in course of time every kind of field work; they plough, they reap the corn, mow the grass, and load it on their shoulders, etc.

This is already a sufficiently long list of drawbacks accompanying Italian emigration on so large a scale, but it is to be feared that besides it renders yet more difficult the solution of a terribly difficult question, the so-called South Italian question, which concerns the realisation of a true unity, economic, social, commercial and industrial, between the two halves of the kingdom so long separated and so different in many respects. It is certainly not by abandoning their beautiful country instead of bearing their part in the common work of the whole that the South Italians can hope to share the prosperity and the progress of the north of the peninsula. The exodus of so many young Italians tells unfavourably on the armed strength of the nation. It becomes increasingly difficult for the War Office to enlist the quota of new recruits for the reserve and the standing army. One hundred thousand yearly are required for the last and 25,000 for the first: but these last years the number for the army, which it was really possible to enlist, fell from 87,000 to 75,000 (1906). The War Office thus sees itself obliged to abolish exemptions and to make the terms of conscription more stringent, but that provokes discontent.

Conclusion.—The writer is conscious of having dealt but inadequately with this vast and intricate subject of Italian emigration. It is a subject which provokes in Italy much controversy and heartburning, and whole volumes are necessary to treat it in all its manifold details. In any

case the exodus of Italians in such numbers from their own beautiful native country is a contemporary fact well worth the study and attention of geographers. It is one of those facts which contribute to change the aspect of the world. There are certainly many good and evil consequences for Italy in this readiness of her children to abandon their native home and seek their fortune abroad in far-off countries, but the writer believes that the evil is about to lessen in consequence of the measures taken by the Italian Government, the increased attention of the public to their brethren abroad, and especially, in consequence of the gradual but uninterrupted development of prosperity, the progress in agriculture, commerce and industry, the amelioration in the situation of peasantry, the alleviation of taxes, commercial treaties with foreign powers, and the increasing importance that Italy, after centuries of foreign oppression, is taking among the great families of nations.

Having obtained by conquest their national unity and independence, after many heroic efforts, the Italians have yet to traverse some difficult paths in their long and glorious history; they have to efface the deep traces of particularism which has so long reigned in different parts of divided Italy; they have to acquire a greater sense of the solidarity of all these unhappily divided parts, but they are certainly now on the road to progress, and there cannot be the least doubt that, notwithstanding the difficulties, they will with their inimitable gifts exercise with the lapse of time an always increasing influence on the civilisation of the world.

PRACTICAL GEOGRAPHY IN SCHOOLS.[1]

By William Miller, M.A., D.Sc., Ph.D., Dollar Institution, Dollar.

(*With Illustrations.*)

The title of my paper, "Practical Geography," embraces a very wide field, each part of which requires specialised knowledge. Those of us who are not trained geographers can scarcely be expected to do justice to branches of the subject which have no relationship to our original specialised studies. It is my intention, therefore, to confine my remarks to the subjects of earth measurement and elementary sun observations.

In actual practice the highest refinement has been attained in this work, but this does not mean that the last word has been said in regard to methods of instruction. Entirely different ends are to be attained in the two cases. Practice aims at almost absolute accuracy, irrespective of labour, time, and even cost: instruments have become so elaborate that it is often difficult to distinguish the underlying principle amongst the numerous and complicated accessories made for accuracy. In school teaching, on the other hand, I take it that a proper understanding of the

[1] An address delivered to the Glasgow Branch of the Secondary Association of Scotland.

fundamental principles is aimed at, with just sufficient practice to bring conviction and fix the idea. To make the work in schools practicable, therefore, the apparatus should be kept as simple as possible; all unnecessary refinements should be dispensed with. This means, to a large extent, a reversion to primitive types of apparatus: to meet a new combination of conditions school instruments will have a development peculiarly their own, and instruments which are inadmissible in practice owing to inferior accuracy may be adopted with advantage in school work. In view of those facts, we, as teachers, must refocus our ideas of field measurement, making a selection of the methods best adapted to school needs. It seems to me therefore that an analysis and discussion of the existing methods will not be without profit.

In such an examination we must constantly bear in mind that the time devoted to this part of the subject is necessarily restricted. The slower methods should consequently be discarded in favour of the more rapid, and too much attention should not be given to methods which are incapable of extension in principle to larger geographical areas. Neither should the subject be regarded as a field of exercise for mathematics—unless in the mathematical class-room—nor, like practical science, as a training in technique. Being a subsidiary subject, however, of an essentially scientific nature, it seems to me that by a proper co-ordination it should be given every assistance by the mathematical and science departments.

Methods of Surveying.

The simplest and most direct method of surveying is by the chain. The ground to be surveyed is divided into a suitable number of triangles, the sides of which are measured directly by the chain. In the case of irregular boundaries the triangulation is supplemented by a series of offsets. The method is useful as an introduction to field measurement, but, as it is impossible to employ it for large areas, as little time as possible should be spent on it. It is a slow and tedious process, and engages comparatively few pupils at a time, unless there are several chains. Additional time is lost in keeping, and in learning how to keep, a systematic record of results, and in transferring them later to paper. As the ground surface is generally sloping or irregular, the measurements are less reliable than those obtained by an indirect method. The simple method of pacing, though less accurate, is to be preferred, as it occupies the whole class at once and teaches the pupil an ever-ready method of estimating distance.

The second method is that of traversing. Here direct linear measurements are combined with angular measurements. The angles are generally measured by means of a theodolite or a prismatic compass. The method is of limited application, being used only for the mapping out of a boundary, a contour line, a winding roadway, or for town planning.

The third method in ascending order of accuracy is the tacheometric method. So far as I know, no attempt has yet been made to adapt the

method to school work. I shall postpone consideration of this method till the more generally accepted methods have been discussed.

The most important of the geographical methods is that of triangulation from a measured base. The triangulation is carried out on two distinct plans. In the more general method the triangulation is continuous, new base lines being determined by means of previously observed points. Beginning from the ends A and B of the measured base AB the angles CAB and CBA are accurately determined by means of a theodolite. In school work the base line AB is drawn to scale and the angles CAB and CBA marked off by means of a protractor. Even with the best instruments this method is much less accurate than that employed by cartographers. AC and BC are calculated trigonometrically and C is determined from the intersection of two circles, one with centre A and radius AC, the other with centre B and radius BC. D is determined in the same way. The distance CD may then be calculated and used as a

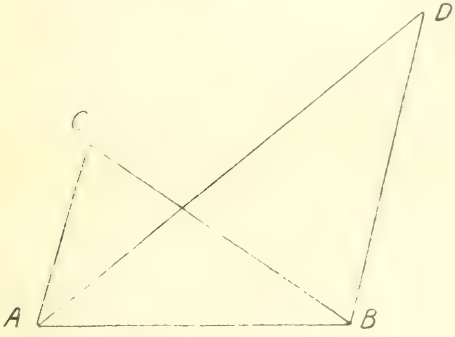


FIG. 1.

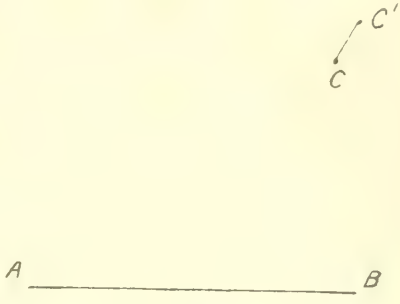


FIG. 2.

new base line. C and D are generally accessible points, and the angles C and D are measured as a check.

In the second method—mostly used in plane tabling—all points to be mapped are observed from A and B, and the angles C and D are not checked.

In view of the fact that cartographers adopt a different method of mapping their results, I doubt the wisdom of excessive accuracy in the measurement of angles in schools. I refer particularly to the use of verniers. In the first place, the class of theodolites used in schools cannot possibly be accurate to one-tenth of a degree. If desirable, the horizontal circle is generally large enough, in any case, to allow of tenths being estimated to a sufficient approximation. But, most of all, when one considers that the final results are generally mapped by means of a much-abused protractor of only half the diameter of the horizontal circle, one fails to see the advantage of a vernier. I think we may safely assume that a pupil exercising ordinary care may make an error of half a degree in the plotting of an angle. Proceeding on this assumption I have calculated the possible error in the position of the apex of a triangle at different parts of the field. If C be the true position of a

point sighted from the ends of the base AB (Fig. 2), and C′ the point actually plotted, then CC′ is the error of the position C. It may easily be shown that, if the error is expressed as a percentage of the mean

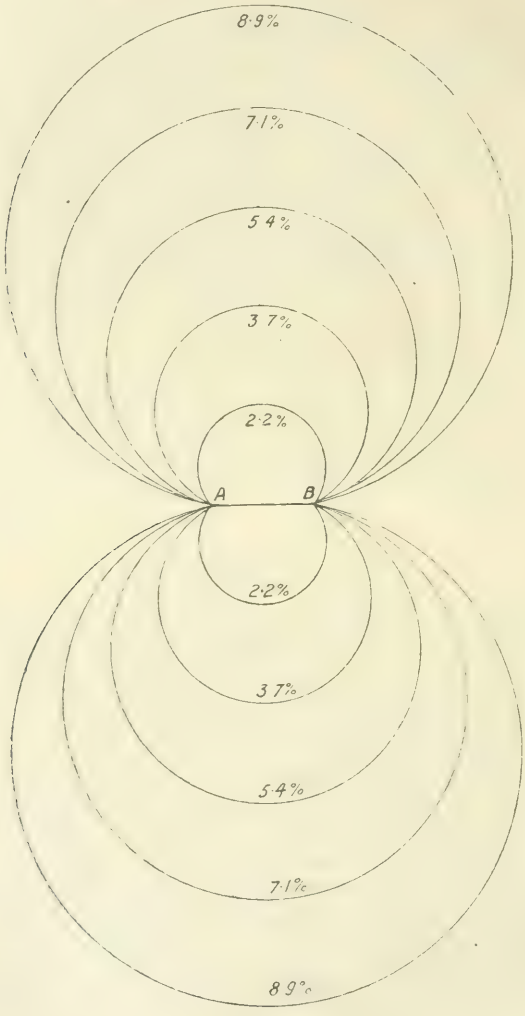


Fig. 3

distance from the ends of the base, points of equal percentage error lie on the arc of a circle. It may be seen from Fig. 3 that points even in the immediate neighbourhood of the base line are subject to a rapidly varying error. The result is that the map is liable to be distorted at certain parts.

The plane table seems to me to be superior in this respect, as the directions are drawn in at the moment of sighting. On the other hand, a theodolite may be used in inferior weather conditions.

Those who have attempted a detailed map by the method of triangulation must admit that it is by no means easy. Careful consideration is required in the choice of a base line so that all points may be visible from the two positions. Every point mapped requires a double observation. In plane tabling this means that a confusing pencil of lines must be drawn from one end of the base line before the observations are completed from the second position. A careful note must be kept of all the positions observed, and even then considerable reliance must be placed on the memory for the exact point sighted. In the end there is probably more geometrical construction on the paper than real map.

My experience of the difficulties to be overcome in class work has led me into a careful consideration of other methods employed in surveying, with the result that I have devised a modified tacheometric method which may prove useful in schools. In consequence of the modification it has become possible to add simple and direct extensions which do not belong to the original method.

In its original form the instrument consists of a telescope having two parallel threads C and D in the focal plane (Fig. 4).

The distance of the threads from each other can be altered and measured by means of a micrometer screw. A pole of known length AB is held horizontally at the point P whose distance from O has to be determined. The distance CD is altered to the apparent size of AB and then measured. Triangle OCD is then a scale representation of triangle OAB, and therefore OP : OQ = AB : CD,

$$\text{or } OP = \frac{AB.OQ}{CD}.$$

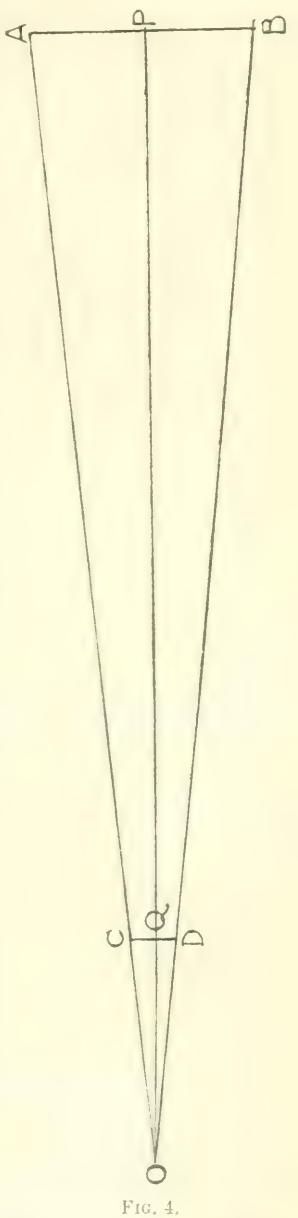


FIG. 4.

AB and OQ are known, and CD is measured, and therefore OP may be calculated. This involves for each position a calculation which is not quite so simple as I have shown.

In a second form CD is kept constant and AB is graduated. If we abolish the telescope a third method is made possible. AB and CD may both be fixed and the distance of CD from the eye O may be varied. In this case O is a direct representation of the distance OP on the fixed scale of CD to AB. Fig. 5 shows the instrument as adapted for school use.

The aperture CD is obtained by mounting two upright knife-edges on a cursor which is movable along the sighting rule of a plane table. The width of the aperture CD is kept constant in constructing a map, and the distance of the knife-edges from the eye varied. The width of the aperture can, however, be varied by means of a fine right and left screw so as to give any desirable scale. The position of the knife-edges is accurately fixed by means of a fine scale and vernier reading to hundredths of an inch. As the point where the sighting rod is pinned down to the plane table is slightly behind the back sight, so must the point marked on the map be at an equal distance behind the knife-edges. At the latter point a small pricker is attached. When P has

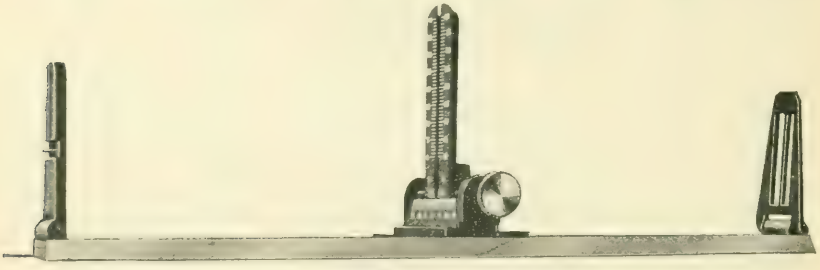


Fig. 5.—The Cartograph.

been sighted the pricker is pressed and the position is accurately recorded on the paper. The pricker regains its former position by means of a spring. The cursor slides freely in a slot in the sighting rod, but grips in any position by means of a spring.

By means of a vertical scale on the knife-edges, divided like the other in twentieths of an inch, the altitude of P can be read off simultaneously. To enable this to be done a fine wire is stretched horizontally on the back sight on a level with the zero of the vertical scale. On bringing the wire into line with the eye and the pole the reading on the vertical scale may be noted. This reading is much simpler for school purposes than any ordinary clinometer reading. In a clinometer the scale is either a scale of angles or of tangents, but here the reading is an exact scale representation of the height observed. With this instrument the drawing of contour line, a difficult and elaborate process with any other instrument, can be carried out simultaneously with the drawing of the map and without extra labour.

To construct a map of a certain region, first determine a suitable scale—say, one inch to 10 ft. This corresponds to $\frac{1}{4}$ inch to 10 ft. (the length of the pole). Make the aperture $\frac{1}{4}$ inch, and mark any point on

the paper to correspond to the place of observation. Pin the sighting rod in this position. Send the assistant with the pole to suitable positions, P, R, S, etc., and mark those positions as above described. To avoid error in sighting, the pole must be held perpendicular to the line of sight. A simple sight is attached to the centre of the pole: when the assistant sights the observer through this the pole must be at right angles to the line of sight. While the assistant is changing his position

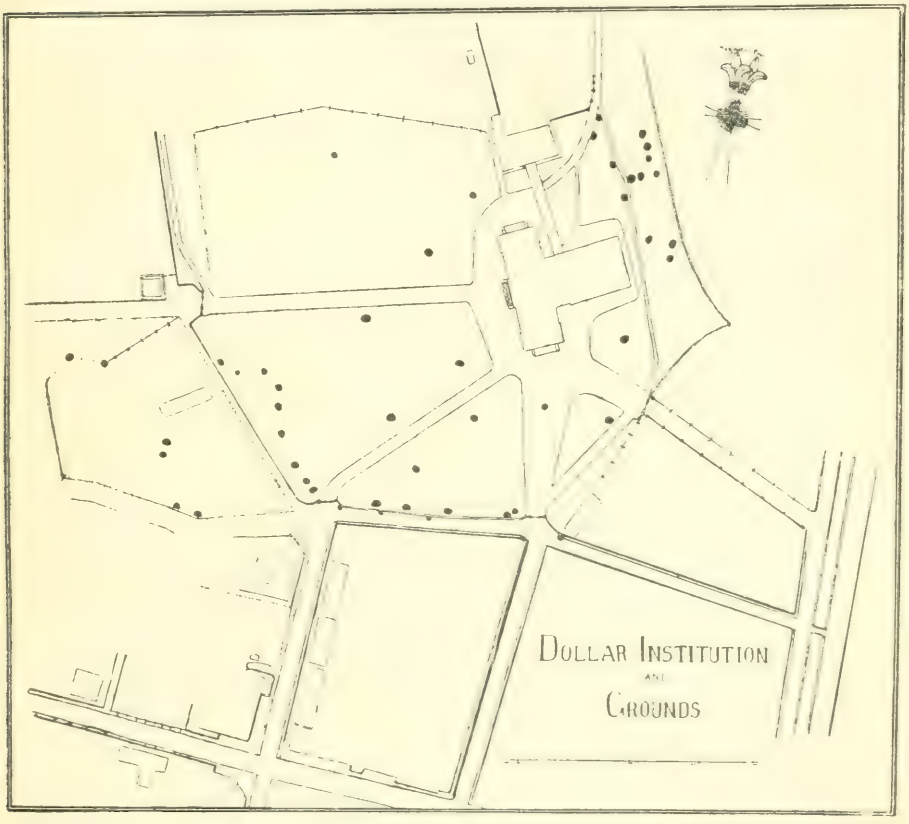


FIG. 6.

the map may be filled in. At the same time the elevations of the points observed are marked in. To enable the eye to be brought low enough for this observation the sighting rule should be brought to the edge of the table. A small correction must be applied to this altitude, equal to the height of the assistant's eye above the table when he stands beside it.

The accompanying map of about 35 acres of ground was constructed by a boy preparing for the Intermediate Certificate. He had no previous experience of map construction and received no assistance. The aperture used was only $\frac{1}{8}$ inch.

To determine the height of an object, the base of which is accessible, place the assistant at the base of the object and level the plane table at a suitable distance away. Sight the pole in the usual way, and note the point of intersection of the top of the object on the vertical scale. On adding the height of the table above the ground the height of the object is obtained.

The following is an example of a measurement made by the instrument:—

Width of aperture used $= \frac{4}{20}$ in.
Height of table $= 4$ ft.
Reading on vertical scale $= 26{\cdot}9$ divisions (of $\frac{1}{20}$ in. in length).

$\frac{4}{20}$ in. represents a pole length,
therefore 26·9 divisions represent 6·725 pole lengths
or 67·25 ft.
Hence the height of the object $= 67\frac{1}{4} + 4$ ft.
$= 71\frac{1}{4}$ ft.

The length of a flag-pole on the top of a building may easily be determined. In this case both top and bottom of the flag-pole are read off on the vertical scale. The readings are subtracted and reduced to feet. No correction is required here.

If the base is inaccessible the following method may be employed:

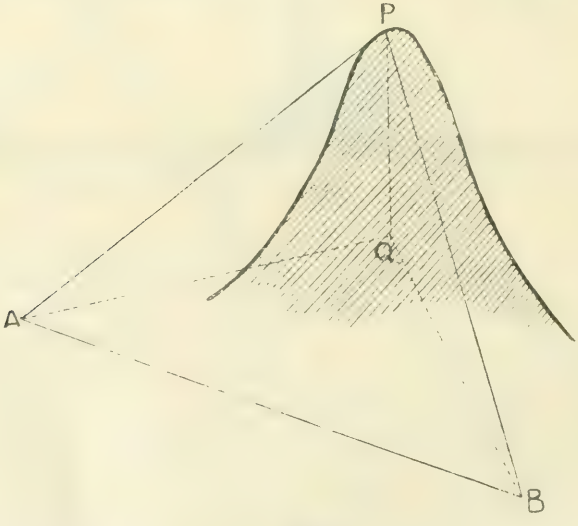


Fig. 7.

Suppose P be the point to be observed and Q the inaccessible base. Level the table in position A, and mark this position on the paper. Bring the knife-edges close together and sight the point P between them, drawing in the direction AQ. Send the assistant to a suitable point B on the same level with A, adjust the knife-edges to a certain scale, and mark the position of B on the paper. Transfer the table to B, level,

and sight the point A along the line BA already drawn. Bring the knife-edges close again and obtain the direction BQ. The point Q is thus determined on the paper. Pin the rule down on B and move the cursor till the pricker just pricks down on the point Q. The altitude read off with the cursor in this position gives directly the height of P. As before, a correction is required for the height of the table at B.

For the sake of comparison with the measurements by the method of triangulation, as made in class work, the following distances were measured and the percentage error determined:

Distance measured.	Aperture used.	Percentage error
92½ ft.	·1 inch.	3·6 per cent.
248 ,,	do.	3·3 ,,
314 ,,	do.	6·5 ,,
150 ,,	·2 inch.	3·9 ,,
388 ,,	do.	3·0 ,,

The errors compare favourably with those obtained in the former method, and since they are equally probable in all directions the map obtained is less likely to be distorted.

This method of surveying seems to me to have an advantage over the others in so far that it is more rapid and direct, no construction lines being required; further, contour lines can be traced in simultaneously, and the survey requires no preliminary planning.

Sun Observations.

I come now to the second part of my subject — astronomical observations.

In the present unsettled state of geographical teaching the question is often asked, "How far is it advisable to proceed in this or that direc-

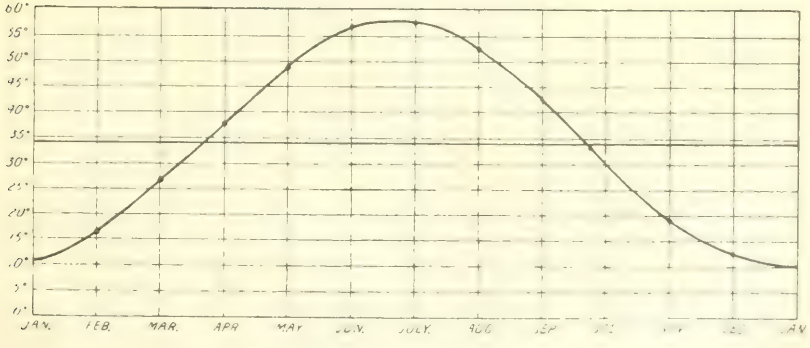


Fig. 8.—Graph of angular altitude of sun.

tion?" So far as astronomical work is concerned a well-defined outer limit seems to me quite clear. Only those heavenly bodies should be taken into consideration which have a direct and important influence on

human affairs, and only in those aspects which contribute to that influence. This eliminates all bodies with the exceptions of the sun and moon. In a logical treatment of geographical facts in which effects are traced to natural causes, the importance of the sun cannot be overestimated. There is hardly a department of geography in which the influence of the sun is not dominant. It is important, therefore, that the connection should be clearly established between the apparent motion of the sun and varying meteorological and vegetative conditions.

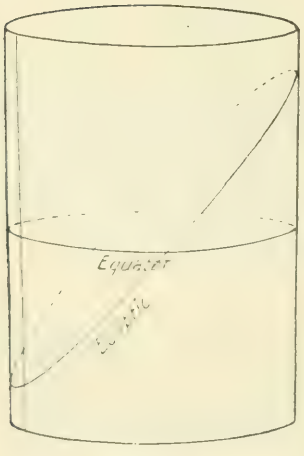


Fig. 9.

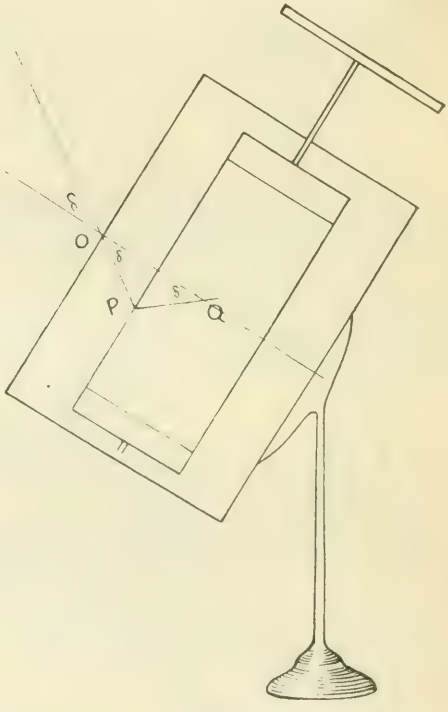


Fig. 10.

I use the expression "apparent motion of the sun" advisedly, as it appears to me a distinct advantage to tacitly regard the earth as the central body and assume that the sun moves round the earth. After all, it is only a question of the point of view, and astronomers themselves find it a convenience to think in this way. In this connection the only characteristic of the sun's motion which is of real importance to us is the obliquity of the ecliptic to the equator. The complete experimental verification of this fact must necessarily demand a year's observations which might well be included in the daily meteorological observations. The difficulty appears to me to lie in the reconciliation of the actual observations with the phenomenon itself. Two methods are open to us. First, we may com-

pare the midday shadows of a stick at various periods of the year. This shows the varying altitude of the sun, but affords no direct means of comparing the position of the sun with the position of the equator, nor of measuring the angular distance. In the second method the angular altitude of the sun is graphed from day to day, the angle being either indirectly determined from the shadow or directly observed by means of a sextant or theodolite. The graph (Fig. 8) has then the appearance of an undulating curve. Even now the connection between the curve and the ecliptic is not quite evident to any one but a mathematician. In teaching this part of the work I have resorted to the device of rolling the graph round a cylinder. The graph gives then a direct representa-

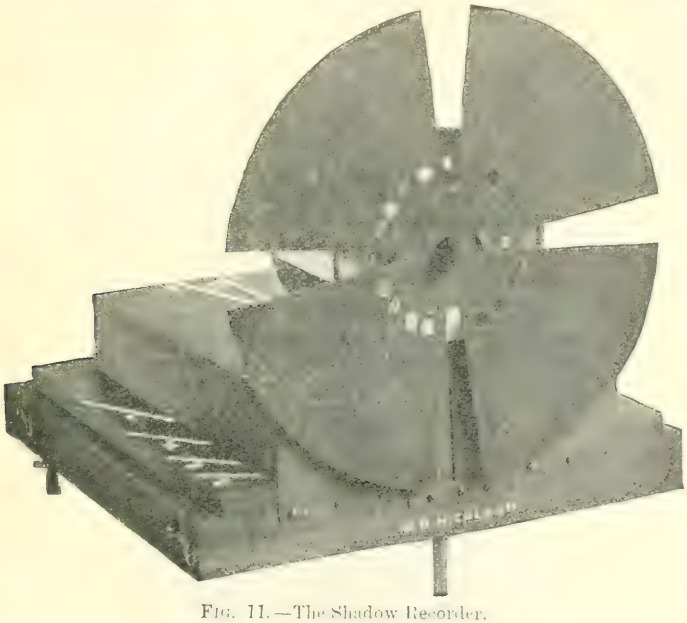


FIG. 11.—The Shadow Recorder.

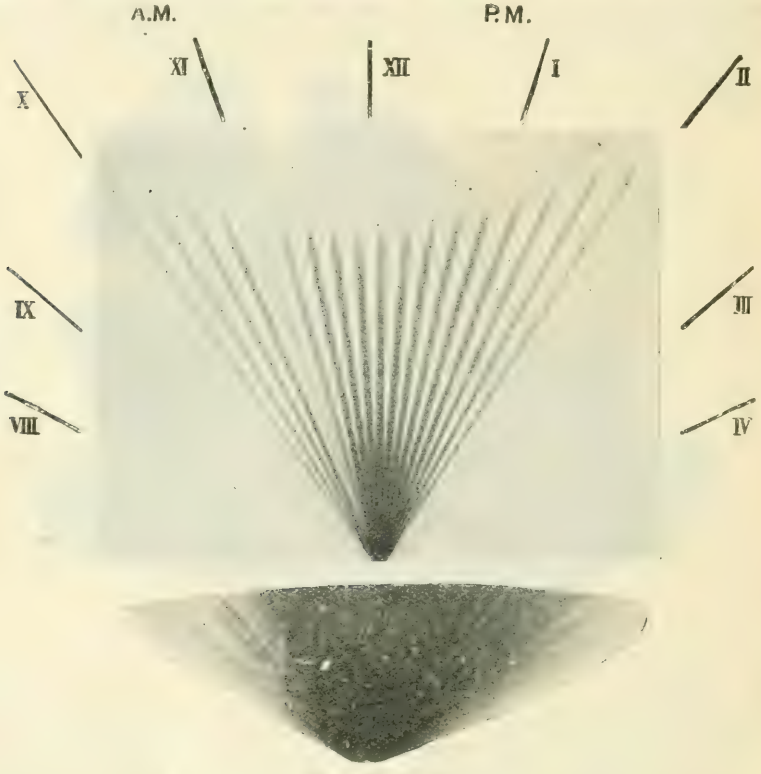
tion of the ecliptic (Fig. 9). Unfortunately the graph has to be rolled into a cylinder instead of a sphere.

The possibility of getting the sun to record its own path on a globe has often suggested itself to me, but so far I have not succeeded in arriving at a solution. It may be interesting, however, to demonstrate the fact that the sun can be made to record its own path on a map (Fig. 10).

If a hollow cylinder containing a coaxial cylinder of half the diameter be mounted with its axis parallel to the earth's axis, and a hole O be made at the middle point of the upper side of the outer fixed cylinder, then a ray of sunlight passing through O will fall on a point P of the inner cylinder so that the angle OQP is equal to the sun's declination. To the inner cylinder fix a disc graduated in 52 equal divisions representing weeks. Cyclostyle a map of the world (cylindrical projection) on photo-

graphic printing paper and wind it round the inner cylinder in an inverted position. If sunlight be admitted at noon once per week and the inner cylinder be rotated one fifty-second part of a complete revolution each week, then the sun will trace its own path on the map.

A simpler apparatus for recording solar shadows automatically is the following:—instead of a shadow of a stick or pin, a beam of sunlight is taken. A narrow vertical slit is cut in the side of a box and inverted over a wooden base containing a sheet of ordinary photographic printing paper. The slit is provided with a hand shutter. By opening the shutter



Figs. 12 and 13.

at any time an image of the slit can be permanently recorded on the paper. The instrument can also be used to illustrate the sun-dial as the edge of the base is marked in hours (Fig. 11). An automatic shutter is also provided, giving an exposure of two minutes every quarter-hour. This consists of an aluminium disc with four sectors cut out of it, which is made to rotate in front of the slit by a small clock. One edge of one of the sectors has a distinguishing mark to enable the clock time to be read off at any instant. The apparent time is read off from the sun-dial and may be compared with the mean time. A record of sunshine during the day may also be obtained by removing the shutter altogether.

Before using the apparatus for other experiments the true north and south line should first be determined by means of it. Set up the instrument to face as nearly south as possible and take a record of the shadows during the day as in Fig. 12. The shortest shadow will point due north and south. A more accurate result will be obtained by bisecting the angle between two shadows of equal length. This direction should now be permanently marked for future reference.

To obtain the magnetic deviation at the place of observation compare the direction, as given by the compass needle, with the true north and south direction.

Fig. 12 (the upper figure) shows the characteristic winter curve for the tip of the shadow. Fig. 13 (the lower figure), a continuous exposure, shows the summer curve. At the Equinoxes the curve becomes a straight line. At the same time the length of shadow in winter and summer may be contrasted. The contrast is scarcely brought out by the above two records, as one was taken shortly before, the other shortly after, the Equinox. This gives a ready means of comparing the heating effect of the sun's rays in summer and winter. By comparing the length of the noon shadow on any day with the length of the slit the latitude of the place of observation may be obtained with a little calculation.

NOTE.—The two instruments described above, which have been recently designed by the author, may be obtained from the undernoted firms—

The Cartograph, for surveying, from Messrs. Baird and Tatlock, 45 Renfrew Street, Glasgow. (Patent applied for.)

The Shadow Recorder, from Mr. W. B. Nicolson, 54 Hill Street, Garnethill, Glasgow. (Patent applied for.)

THE INTERNATIONAL MAP OF THE WORLD.[1]

WE have received a copy of this Official Report of the work done by the International Committee, which met in London last November, and of whose labours we have already given some account (cf. p. 38 of the present volume), based upon newspaper reports. The Official Report gives the full text of the resolutions, in English, French, and German; a list of the delegates; an account of the proceedings; two supplementary resolutions, which were not considered to be within the terms of reference of the Committee, but which were discussed and passed informally, together with some supplementary matter.

The names of the delegates who took part in the proceedings are as follows:—

AUSTRIA: Imperial Royal University, Professor Dr. Eduard Brückner. AUSTRIA-HUNGARY: Imperial and Royal Government Counsellor Vinzenz Haardt von Hartenthurn, of the Imperial and Royal Institute of Military Geography. FRANCE: M. Beurdeley, Sous-Chef du

[1] *Resolutions and Proceedings of the International Map Committee assembled in London, Nov. 1909.* With Diagrams, Plate, and Tables. London: Printed for His Majesty's Stationery Office. 1910. Price 2s.

Service Géographique à l'Administration Centrale des Colonies; M. Ch. Lallemand, Ingénieur en Chef des Mines, Membre du Bureau des Longitudes, Directeur du Nivellement Général de la France; M. le Commandant Pollachi, Chef de la Section de Cartographie au Service Géographique de l'Armée; M. Vidal de la Blache, Membre de l'Institut, Professeur à la Faculté des Lettres de l'Université de Paris. GERMANY: Professor Dr. Joseph Partsch (Leipzig), Kgl. Sächsischer Geheimer Hofrat; Professor Dr. Albrecht Penck, Geheimer Regierungsrat, of the Geographical Institute of the Royal University of Berlin; Major Baron von Tettau, of the Great General Staff; Major Wilckens, of the Great General Staff. GREAT BRITAIN AND BRITISH DOMINIONS: Lieut.-Colonel C. F. Close, Head of the Geographical Section of the General Staff, Honorary Secretary of the Royal Geographical Society; Colonel S. C. N. Grant, Director-General of the Ordnance Surveys of Great Britain and Ireland, President of the Committee; Dr. J. Scott Keltie, Secretary of the Royal Geographical Society. AUSTRALIA: Mr. Cecil W. Darley, Member of the Institute of Civil Engineers. CANADA: Mr. R. E. Young. HUNGARY: Royal University Professor Dr. Ludwig Lóczy, President of the Royal Hungarian Geographical Society; Secretary to Professor Loczy, Dr. Kogutovicz, Treasurer of the Royal Hungarian Geographical Society. ITALY: Lieut.-Colonel Cavaliere Eugenio Caputo, of the General Staff. RUSSIA: Mr. Eugène Markow, Member of the Imperial Russian Geographical Society. SPAIN: Don Luis Cubillo, Head of the Cartographical Department of the Geographical and Statistical Institute. UNITED STATES OF AMERICA: Mr. Bailey Willis, United States Geological Survey, Chairman of the American Committee on the One-Millionth Map: Mr. S. J. Kubel, United States Geological Survey. Secretary, Captain T. T. Behrens, of the Geographical Section of the General Staff. Adjutant to the President, Captain W. J. Johnston, of the Ordnance Survey.

The whole of the delegates signed the resolutions, which are as follows:—

The above-named having been appointed by their respective Governments to recommend the system on which the International Map of the World, on the scale of 1 in 1,000,000, should be produced, submit the following resolutions. Each one of the resolutions was voted unanimously:

General Resolution.

1. It is desirable that a uniform set of symbols and conventional signs be adopted by all nations for use on the map of the world on the scale of 1 : 1,000,000, and that the limits of the sheets, etc., shall be uniform.

Area of each Sheet.

2. (*a*) Each sheet of the map shall cover an area 4 degrees in latitude by 6 degrees in longitude.

(*b*) North of latitude 60° N., and south of latitude 60° S., it shall be permissible to join two or more adjoining sheets of the same zone, so that the combined sheet covers 12, 18, degrees, etc., of longitude.

Limit and Number of Sheets.

3. (*a*) The limiting meridians of the sheets shall be at successive intervals, reckoning from Greenwich, of 6 degrees: and the limiting parallels, reckoning from the Equator, shall be at successive intervals of 4 degrees.

(*b*) Each sheet of the map shall bear an international number, indicated in a diagram included in the Report, thus:—

North B. 12.

The zones, extending from the Equator on each side to 88° latitude, are given letters from A to V preceded by the words North or South.

The polar areas are lettered Z.

The sectors, from longitude 180° E. or W. of Greenwich, are given numbers from 1 to 60, increasing in an easterly direction.

(*c*) Each sheet shall, in addition, bear the name of the locality or most important geographical feature on the territory represented, and also the geographical co-ordinates of its central point.

(*d*) Each sheet shall show a small index diagram, giving the names and numbers of the eight surrounding sheets.

Degree Lines.

4. Each degree line shall be drawn right across the sheet.

Projection.

5. (*a*) It is necessary that the projection should fulfil the following conditions:—

(i.) The meridians should be straight lines.

(ii.) The parallels should be arcs of circles of which the centres should lie on the prolongation of the central meridian.

(*b*) In view of the fact that on the scale proposed several suitable projections differ but little from each other, and that the contraction and expansion of the paper on which the map is printed affect all lengths on the map, and prevent it from being in fact exactly either orthomorphic or equivalent, it is not necessary to lay great stress upon the selection of a projection which has the best properties as to conformity or equivalence. It is therefore agreed to select a projection which can be easily constructed, and which permits every sheet to fit exactly together with each of the four sheets adjoining each of its four sides.

A modified polyconic projection, with the meridians as straight lines, satisfies these two conditions.

(*c*) The projection shall thus be constructed: Each sheet shall be plotted independently on its central meridian. The central meridian shall be a straight line marked off in degrees.

Through the points so marked circles are drawn to represent the parallels. The centres of the circles are situated on the prolongation of the central meridian. The radius of any circle $= \nu \cot \lambda$, where ν is the normal terminated by the minor axis, and λ is the latitude of the parallel represented.

Along the limiting parallels, *i.e.* along the circles forming the north

and south edges of the sheet, the degrees of longitude are marked off in their true lengths to scale.

Corresponding points on the limiting parallels are joined by straight lines; these straight lines represent the meridians.

The meridians which are true to scale are those which are 2 degrees to the east and west of the central meridian respectively. The actual length of the central meridian is the true length to scale, minus the small correction which is necessary to effect this, and which is shown in a special table.

Hypsometric Colours and Contours.

6. (*a*) The map shall be a hypsometric map, *i.e.* the successive altitudes shall be indicated by a system of colour tints.

There may, however, be published other editions without altitude tints, and these may be completed by tints, or by additions required for other purposes.

(*b*) Normally contours shall be drawn at vertical intervals of 100 metres reckoning from sea level. But in very hilly districts the contours may be at larger vertical intervals, provided that they are spaced at 200, 500 or 1000 metre intervals. In very flat country additional contours may be inserted provided that they are spaced at 10, 20, or 50 metre intervals.

(*c*) Minor features of importance, which would not be shown by the contouring, may be represented by shading, excluding hachuring, and in that case the method of lighting which is the most effective for the region will be selected.

(*d*) In parts where the country is not sufficiently surveyed to enable the contours to be drawn, the terrain shall be shown by broken contours or form lines.

(*e*) The form of the bed of the sea or of a lake shall be shown by blue contours, the vertical intervals being normally 100 metres, but intervals of 10, 20, or 50 metres may be used. The datum level in each case is to be the mean surface level of the sea, or of the lake for a given date.

Lettering.

7. (*a*) The lettering shall be in varieties of the Latin characters.

(*b*) In those cases in which the Latin characters are not in use in the country in which the sheets are produced, a supplementary national edition may be published.

(*c*) A distinction shall be made between the lettering applied to Hydrography and that applied to other features. The former shall be in sloping characters, the latter in upright characters, except as provided for names applied to routes of communication.

(*d*) A classification of and general types of standard lettering (attached to the Report) are approved for use on the International 1:1,000,000 map. The question of gauge has been left entirely to the discretion of the cartographer. It is understood that the size of lettering will vary with the relative importance of the names.

(*e*) All figures denoting heights shall be upright. Figures denoting depths shall be sloping.

(*f*) The lettering used for scales, sub-titles, and other explanatory matter appearing outside the sheetlines of the map shall be in upright Roman capitals and lower case.

Spelling and transliteration of names.

8. (*a*) The spelling of every place-name in an independent country or self-governing dominion, using the Latin alphabet, shall be that adopted by the country or dominion.

(*b*) The spelling of every place-name in a colony, protectorate, or possession, shall be that adopted by the country governing the colony, protectorate, or possession, if that country uses the Latin alphabet, or publishes other maps in which the place-names are printed in the Latin alphabet.

(*c*) In the case in which certain important localities have also, in addition to the official name, another customary name notably different, the latter shall be printed on the map, in small characters, underneath the official name.

(*d*) An explanatory legend shall be printed to show, with reference to the names on the sheet, the Latin letters which are necessary to represent the same sounds in other languages employed in the international map.

(*e*) It is suggested that the Governments of those European or extra-European countries which do not use the Latin alphabet, should publish an authorised system of transliteration.

(*f*) In the case of Chinese place-names, that transliteration shall be adopted which is used by the Chinese post and customs services. The same rule shall apply to other countries in which similar conditions obtain.

Colours of detail.

9. (*a*) Hydrographic features, including glaciers, shall be in blue.

Water shall be shown by a uniform tint of blue wash, and not by water-lining.

A distinction shall be made between perennial and non-perennial streams.

(*b*) Contours shall be in brown.

(*c*) Roads shall be in red.

(*d*) Railways shall be in black.

(*e*) The name of the feature shall be printed in the same colour as the conventional sign of the feature itself, with the exception of mountain names, which shall be in black.

(*f*) The hypsometric tints shall be those of the colour scheme attached to this Report.

(*g*) Country lying below the mean level of the sea shall be shown by a special tint of dark green.

Scales.

10. (*a*) A scale of kilometres shall be drawn on each sheet.

(*b*) An additional scale of miles, or other national unit, may be drawn if required.

Heights.

11. (*a*) The heights above mean sea level shall be shown in metres.

(*b*) The values in feet, or other national unit, may be added, to the nearest unit, if desired.

(*c*) The heights of the mean levels of the surfaces of lakes and inland seas above mean sea level shall be given.

(*d*) The datum level both for heights and depths shall be the mean sea level, deduced in each country from tidal observations on its own coasts.

Conventional Signs.

12. (*a*) In the case of rivers, rapids and other obstructions to navigation are, as far as possible, to be indicated.

(*b*) Roads and tracks should be divided into two classes, those which are suitable for wheeled traffic, and those which are not.

(*c*) It is agreed that where it is decided to represent features provided for in the attached reference, they shall be shown by means of the conventional signs given here.

In the case of details not provided for below, other signs may be used at the discretion of each Government.

(*d*) For convenience of reference and indexing, the inner margins of each sheet shall be provided with Arabic letters from top to bottom of each side margin, and with Roman numerals from left to right along both the upper and lower margins.

Two of each (letters or numbers) shall appear within each degree of latitude or longitude respectively (*see* sheet of conventional signs).

(*e*) At the foot of each sheet shall be printed a Reference, explaining all the conventional signs used in that sheet.

(*f*) Each sheet shall bear a list of the principal sources of information from which it is constructed.

Exchange of material.

13. In the case in which a sheet covers an area belonging to several neighbouring countries, it is desirable that the Government producing the map should consult the Governments of the other countries on the subject of the material available, especially as regards the nomenclature.

The following are the Supplementary Resolutions, to which allusion has been made above :—

A. It is the unanimous opinion of the International Committee that it is desirable that the International Map of Europe, on the scale of 1 : 1,000,000, should be produced by some one single European cartographic establishment, Government or private.

That the other 1 : 1,000,000 maps of large areas of the land surface

should be undertaken by the existing Government cartographic establishments interested; thus the Government of the United States would undertake the production of the 1 : 1,000,000 map of the United States, the Russian Government would undertake the 1 : 1,000,000 map of Siberia, the Governments of Canada and Australia the 1 : 1,000,000 maps of those Dominions.

That those Governments which have produced maps of large areas on the 1 : 1,000,000 scale in the past should continue the series in the future on the newly approved system: thus, the French Government would continue the maps of Asia, the German Government the maps of China, and the British Government the maps of Africa.[1]

B.—That it is the sense of this Committee that it is most desirable that the standardisation of the international geographic map of the world should be followed by international agreements on maps relating to meteorology, geology, zoology, botany, and other sciences.

The large plate which accompanies the Report shows the conventional signs, etc., to be used on the sheets of the map, as well as the tints for altitudes and ocean depths. Of the signs it may be sufficient to say in general terms that they are for the most part self-explanatory to those accustomed to dealing with the Ordnance maps of this country, and with the official maps of other countries.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

On the occasion of his lecture in Edinburgh on May 24, Commander Peary was presented by the Society with a silver model of a ship, representing a three-masted vessel of the late sixteenth-century type in full sail. On one of the sails is engraved the badge of the Royal Scottish Geographical Society, while another bears the following inscription in Latin :—

"Hanc effigiem navis talis quali Johannes Davis, Henricus Hudson, Wilhelmus Baffin, Orarum Borealium Navigatores olim Illustrissimi utebantur Roberto Edwino Peary, Civi Americano, Regionum Arcti gelidæ Indagatori Antecessoribus audacibus haud minus audaci Qui Primus ad Metam Pernobilem ab innumeris Nautis intrepidis tam diu petitam Polum Septentrionalem pervenit, donum dedit Societas Geographica Scotica Regalis gratulans, admirans, recognoscens, Edinburgi, Maii XXIV., MCMX."

[1] This would in no way prevent any Government from undertaking the preparation of sheets of its own colonies. In such a case it is desirable that the Government undertaking the preparation of such sheets should communicate its intention to the other Governments interested.

GEOGRAPHICAL NOTES.

Africa.

The Fish of Lake Chad.—A note in *La Géographie* summarises a recent paper read before the Paris Academy of Sciences by M. Pellegrin on this subject. The various recent expeditions have brought back a considerable number of fish from Lake Chad, but of sixty-five species now known from the lake, only six are peculiar to it. The other species resemble those of the Nile, Senegal, and Niger. With the fish of the Congo the affinities are less close, while there are very few forms common to the Chad and to the Zambezi and the rivers of South Africa. The interest of these facts is that while, generally speaking, there is great homogeneity in the fresh-water fauna of Africa, certain lakes of great depth, such as the Victoria Nyanza and Tanganyika, form exceptions, remarkable for having a highly peculiar fauna. Thus of 115 species of fish found in Tanganyika, ninety-nine are not known outside the lake. The depth of such lakes, no less than their peculiar fauna, speaks to long isolation. On the other hand the existence of few peculiar species in Lake Chad is related to the shallowness of the lake, and to its free communication with the neighbouring basins.

Locusts in South Africa.—In recent issues of *Nature* accounts are given of the work of the South African Central Locust Bureau, which contain some interesting points. The Central Bureau includes representatives from a very large area of South Africa, including not only British but also Portuguese and German territory. It collects information and spreads information in regard to locusts throughout the area of its operations, the actual preventive and destructive measures being carried out by the local governing bodies concerned. It is found that two species of locust tend to become plagues in South Africa. One, the red-winged locust, infests the east coast districts, migrating in summer and spring, and retiring to the forests, probably of the Zambezi region, in winter. The other, the brown locust, inhabits the Kalahari Desert, where it is practically inaccessible, and from this region it periodically descends in swarms upon the cultivated ground. Its eggs are laid in winter, and hatching is due to the influence of the summer rains. Drought may lead to the postponement of hatching, hence one cause of the varying numbers of the pest. It is the young locusts or "voet-gangers" which are so destructive, and these are attacked by burning the grass lands, poisoning the crops with arsenic and sugar, as well as by encouraging locust-eating birds. During 1907-8, a very bad locust year, nearly £12,000 was spent in the locust campaign.

Anthropogeographical Investigations in North-West Africa.—In the *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, 1909, Herr L. Frobenius gives a summary of a lecture delivered before that Society, which was based upon his travels in North-West Africa. Excluding the Mediterranean region, he points out, North-West Africa can be divided

into three zones. These are, the Sahara in the north, the West Sudan in the middle, and to the south the lands fringing the Atlantic Ocean. The three zones are very sharply demarcated. In the north the absolute drought makes cultivation possible only beside the scattered oases, and favours the development of cattle rearing. In the Sudan heavy rain alternates with periods of drought, and owing to the undeveloped drainage much of the land tends to become converted into swamps and morasses in the wet season, and then subjected to desert conditions in the dry season. In the wet season both man and beast can be sure of water everywhere, in the dry it is obtainable only in certain perennial streams and from deep wells. The land here is very fertile, sorghum, millet, maize, and rice all growing well, and all being cultivated by means of the hoe. It is therefore a land of settled cultivators, who communicate with one another through the intervention of the migratory pastoral peoples. The third zone includes the Upper Guinea coast-belt and its hinterland. The copious rainfall here produced formerly dense forest, which has now been largely destroyed by the cultivators, so that the trees in many places persist only on hilltops, and in other localities not well suited to cultivation. Here the chief food-plants are bananas and manioc. The complete disappearance of nomadism is indicated by the replacement of cows and long-legged sheep by black pigs and short-legged goats. The people live in fortified and concealed towns, as they are constantly liable to raids from the Sudan.

In such cases the most usual interpretation of the conditions is to say that the most highly specialised are the plantation people, with their well-ordered towns, their well-kept groves, their various material possessions. At first sight, according to the author, this interpretation certainly suggests itself, the contrast with the dirty and apparently poor pastoral folk being very striking. Further acquaintance with both peoples, however, convinced him that this impression is erroneous. The culture of the cultivators is, he says, a purely material one. It is based upon the work of the women, and is adapted to a limited set of conditions. Rob these people of their material possessions, or remove them from their familiar environment, and they show little intelligence or adaptability. The nomad's possessions are so few that to lose his material all is to lose little, nor can he be robbed of his greatest possession, his awakened intelligence. Herr Frobenius not only found these nomads highly intelligent, but he also found a development of personal interests, similar to that found among more civilised communities. One individual would have a wide knowledge of simples, another was the repository of the law and equity of the tribe, another of its traditions, and another was the genealogist of the group. The nomads cannot, therefore, be looked upon as lower in culture than the cultivators.

The next point of interest is the source of this culture. It is well known that about the year 1000 a wave of Mohammedan culture spreads outwards from Morocco and overwhelmed a great part of the western Sudan. It has been currently believed that whatever advanced civilisation the peoples of this region show, is the direct result of the Mohammedan influence. This, however, overlooks the other well-known fact,

illustrated in the history of Christianity as well as of other religions, that a new religion tends to take over, in a slightly modified form, the existing traditions and culture of the proselytised race. Herr Frobenius thinks there is much evidence to suggest that North-Western Africa had reached a high level of civilisation when it was overwhelmed by the Mohammedan wave, which rather destroyed than created a culture. Without following the author into the evidence in detail, we may note that he believes that at an early period a high degree of civilisation existed on the Mediterranean sea-board of North-West Africa. The peoples living here, perhaps as the result of a circumnavigation of north-western Africa, were attracted southwards by the discovery of gold and other metals on the Guinea coast. As the result of this discovery routes were opened up across the Sahara, and by these migrations took place. The difficulties of communications, however, resulted in a breaking up of the migrants into groups. The people of the Mediterranean seaboard remained within reach of Mediterranean influences. The people of the Sahara, from their conditions of life, necessarily lost what the author calls the material part of their civilisation, while still retaining its intellectual side. The people of the southern region, more favourably situated, while retaining the material side of their civilisation, lost some of the intellectual qualities of their ancestors. But it is to the earlier state, not to the Mohammedan wave, that both owe their traces of a relatively high civilisation, and the author believes that some form of that earlier civilisation constituted the Atlantis of the ancients.

The Okawango-Zambezi Region of German West Africa.—The first part of the twenty-second volume of the *Mitteilungen a.d. Deutschen Schutzgebieten* is devoted to a long article on that eastward extension of German West Africa which lies between the Okawango and the Zambezi. The article is based upon journeys made in the region in 1905-6 by Herr Franz Seiner, and is illustrated by a large map and numerous photographs. It treats in much detail of the geology, climatology, botany, ethnography, topography, and economics of the region. From this mass of detail we extract a few of the more general points.

The region forms the southern boundary zone of the Northern Kalahari region or great South African basin. The Northern Kalahari is not separated from the Middle Kalahari by any natural boundary, but yet the two regions show remarkable differences in regard to climate and therefore, also, in regard to vegetation. The Northern Kalahari is part of the African steppe region, but it is characterised by a relatively large precipitation for a steppe region. The result is the appearance of forest, but of forest of the drought-resisting or xerophilous type. The height of the trees distinguishes this forest from the bush region of the Middle Kalahari where the precipitation is smaller. The forest again falls into two divisions. To the north we have the Houtbosch forest (*Berlinia baumii*), which to the south is replaced by the Burkea forest (*Burkea africana*, a tree of the Leguminosae family). The southern limit of this Burkea forest, which marks also the boundary between the north and middle regions of the Kalahari, is about 19° S. lat., while its northern limit lies

between 15° and 17° S. lat. The Okawango-Zambezi region lies, therefore, within the Burkea zone. Though the rainfall is scanty, probably 600-700 mm. (23-27 inches) per annum, the borders of the rivers and the flood-plains lend themselves to cultivation, which is possible in the rainy season without irrigation. Cotton, rice, sesame, sugar-cane, earthnuts, maize, corn, and tobacco are grown. The future of the region depends especially upon native agriculture. The natives seem to learn western methods easily, and are aided by the fact that draught animals can be reared in the region. At present the number of such animals is small on account of the ravages of rinderpest. The population is scanty. In the whole area of 16,000 square miles there are only 24,000 inhabitants, or 1·5 per sq. mile.

The rains are summer rains, the year being divided into a summer rainy season of about six months, and a winter dry season of about the same length. The rainy season begins at the middle or end of September and ends at the beginning of April. Variation occurs less in the duration of the rainy period than in the intensity of the fall: rainy and dry years often alternate, and disastrous droughts are frequent. Very important for the crops are the spring rains, which last normally from the end of September to the end of December, and are followed by a dry period of two or three weeks. Cloud is frequent. In the dry season the night temperature often falls below freezing-point, the first frost often coming in May, and being sometimes very destructive to crops. In June the night temperature may fall to 21·8° F. or even lower, and the rapid fall of temperature after sundown is very marked. The temperature has been known to fall from 48° F. to 28° F. in half an hour, and variations occur every few minutes. Similar, but reversed conditions, occur at sunrise. April is the pleasantest month, the nights being cool without being cold, and the sun often obscured by clouds during the day.

As to the plants, as already noticed, the region lies in the zone of xerophilous forest, the principal tree being *Burkea africana*, which reaches a height of fifty feet. In the low-lying areas and those liable to flooding in the wet season another type of wood occurs, in which *Terminalia sericea* and various Acacias predominate. Again, where shallow sand lies upon stony ground, forest is replaced by bush, chiefly acacia scrub.

Death of Lieutenant Boyd Alexander.—Members of the Society who heard Lieutenant Boyd Alexander lecture on his expedition from the Niger to the Nile in Edinburgh in November 1907, and who have followed the recent expeditions of this explorer, will regret to learn that he was murdered in the Wadai region at the beginning of April. The tragedy is all the greater in that it will be remembered that the first great African expedition in which Lieutenant Boyd Alexander took part cost the life of his brother, Captain Claude Alexander, and of his other companion, Captain Gosling. As already noted here, Lieutenant Alexander started on his present expedition at the end of 1908, and went in the first instance to explore the islands of Sao Thomé, Principé, and Annobon. He subsequently went to the Cameroon Mountains (*cf.* xxv. p. 432), where he experienced an earthquake. From here he went

to Nigeria, and was believed to be in the vicinity of Lake Chad, endeavouring to collect a caravan of camels in order to attempt a crossing to the Nile in the region north of the Wadai state and Darfur. Fighting has been going on in the French Sudan between the French and the people of Wadai, and the murder of Lieutenant Alexander was no doubt connected with this unrest. Lieutenant Alexander was born in 1873, and was thus only thirty-seven at the time of his death. His companion, the Portuguese collector, José Lopes, has escaped, and it was through him that the news of the murder reached civilisation.

America.

The Yakutat Bay Region, Alaska.—We have noted here several times the interesting work which has been done by Professor Tarr and others in connection with the recent marked advance of certain of the glaciers of the Yakutat Bay region in Alaska (cf. this *Magazine*, xxiii. p. 382, xxiv. p. 36). We have recently received a monograph on the region by Messrs. Tarr and Butler, which forms Professional Paper 64 of the U.S.A. Geological Survey. As usual with these monographs, the present one is beautifully illustrated, and gives an account of a region where the glaciation presents striking differences from the more familiar type visible in the Alps. Apart altogether from the special point of the changes now occurring in the region, the district presents many points of great interest, especially in connection with the phenomena of glacial erosion. As we have devoted a considerable amount of space to this subject of recent years, it may suffice to say that the descriptions and illustrations make clear the usual points in regard to this type of erosion, that is the hanging, U-shaped valleys, and the other features of glacial topography. A point of special interest, however, is the occurrence of what Professor Tarr calls "through glaciers." He defines a through glacier as "a continuous ice-filled valley from the terminus of one glacier to that of another, across a flat divide from which, in some area of indefinite location and extent, ice drainage flows in both directions." The result of the slow movement of the ice in the "through" region is that this region forms an excellent highway from one valley to another, and in some cases it is or has been actually used as such by prospectors. The same thing of course occurs on a small scale in the snowfields of the Alps at present, and occurred on a large scale in the Alps of the Ice Age. It will be found of great interest to read the descriptions of the origin of the great passes of the Alps, as set forth in Penck and Brückner's *Die Alpen im Eiszeitalter*, with Professor Tarr's descriptions of what is now occurring in Alaska.

As to the cause of the present advance of certain of the Alaskan glaciers, Professor Tarr finds that the only hypothesis which seems to explain the facts is that the sudden marked advance is due to an increase in the snow-supply as a result of earthquake shaking, this shaking having started avalanches which gave the glaciers a forward thrust.

Professor Tarr only notes briefly the characters of the Malaspina glacier, which has been fully described by Professor Russell. We learn,

however, that the Department of Geology of the University of Wisconsin has prepared a model of this glacier, and the adjacent region near Mount St. Elias and Yakutat Bay. A figure of this model has been sent to us, together with a descriptive leaflet, from which we quote the following:

"The model includes about 7350 square miles in Alaska and Canada, near 60° N. latitude, and 140° W. longitude. On this model, whose vertical and horizontal scales are the same (1 : 80,000), about one mile and one-quarter equals one inch. The model is about seven feet by four and two-thirds feet.

"The model shows a portion of the lofty St. Elias range, whose snow fields cover everything above 2500 to 3000 feet, where slopes permit. From these snow-fields innumerable glaciers extend down the valleys, in several cases reaching the Pacific Ocean, Disenchantment Bay, or Russell Fiord, and discharging icebergs. One great group of these valley glaciers has united at the foot of the mountains in a piedmont glacier—the Malaspina glacier—whose area exceeds 1500 square miles. Most of this area is clear ice, but where parts of the border are stagnant they have been covered by ablation moraine, upon parts of which forests have grown. This is the largest glacier in the world outside the Arctic and Antarctic regions.

"The east half of the model shows a series of fiords with cirques, hanging valleys, etc., produced by ice erosion when the glaciers were more extensive, as well as the glacial coastal plain known as the Yakutat Foreland. Marginal lakes, medial, terminal, and recessional moraines and outwash plains are shown.

"The region is especially interesting because of the original studies of this piedmont glacier and its surroundings by the late Professor I. C. Russell, and because it includes the origin of the Yakutat Bay earthquakes of 1899, during which there was faulting, and shore lines were differentially uplifted. Subsequently the east portion of the Malaspina glacier and several adjacent ice-tongues have begun the most extensive glacial advance of historic times.

"Copies of this model may be obtained from the Secretary, Board of Regents, Madison, Wisconsin."

Australasia.

British Expedition to New Guinea.—It is announced in the daily press, through Reuter's agency, that this expedition has made the interesting discovery that a "pigmy" race lives at an elevation of about 2000 feet in the Charles Louis Mountains in New Guinea. There is reason to believe that these pigmies are Negritos, the dwarf race known to occur in the Andaman Islands, in the Philippine Islands, and in the northern part of the Malay Peninsula. Hitherto it has been believed by anthropologists that this curious race did not occur in New Guinea, in which area no certain trace of them has hitherto been found. Elsewhere they have been the subject of many detailed studies, on account of their remarkable and presumably primitive characters. One of these studies was devoted to the Negritos of Zambales in Luzon, one of the Philip-

pines, where the geographical conditions have lead to the persistence of a singularly pure stock. We analysed this investigation somewhat fully here (vol. xxi. p. 539), and reference may be made to that article for details. It is probable that the stock just discovered is also pure, as the mountain habitat must have led to great isolation.

The expedition are apparently also on the verge of another interesting discovery, for it is stated that they have seen the tracks of a large hoofed animal, apparently hitherto unknown.

Polar.

Captain Scott's Antarctic Expedition.—The *Terra Nova*, with this expedition on board, left the Thames on June 1, proceeding thence to Portsmouth and Cardiff. The latter port was left in the middle of June for Madeira and Cape Town, which it is expected to reach on August 1. Captain Scott gave a lecture to the Royal Institution before his departure, in which he set forth his complete plans as follows:—

After a week's stay at Cape Town the ship will sail for Melbourne, reaching that port about September 13, and will afterwards call at Sydney and Lyttelton, New Zealand, where she is due to arrive about October 13. A few stores, such as petrol for the motor-sledges, will be taken on board at Lyttelton, as well as the twenty ponies and thirty dogs which Mr. Meares is shipping from Vladivostock. Hitherto Antarctic expeditions have sailed to the South in the latter part of December, but with a large ship like the *Terra Nova* it is hoped to penetrate the pack ice at an earlier date than it had been possible for previous expeditions to do, and accordingly the ship will leave New Zealand towards the end of November, and probably reach M'Murdo Sound about the end of December. Immediately on arrival in M'Murdo Sound, the hut, provisions, and equipment of the western party will be landed. The party will consist of from twenty-two to twenty-five persons, and as soon as the winter station has been thoroughly established, the greater number of these will proceed to the south to lay depôts. It may be possible to start this party off not later than the third week in January, when sixty or seventy days will remain for travelling. At the same time, the ship will leave M'Murdo Sound and proceed to the eastward to explore King Edward's Land. A small eastern party, if left, will be left with full supplies and some transport facilities. If this party is safely landed, Captain Scott will endeavour to give them some connection with the western party—400 miles to the westward—by landing additional stores at one or two places on the barrier edge, if such places can be found. After landing the eastern party, the ship will return to M'Murdo Sound, and then proceed to the northward. Captain Scott believes that at the latest this will be in about the third week of February, and that a considerable supply of coal will still remain in the ship. If that is so, she will be directed to investigate the pack in the region of the Balleny Islands, and to proceed to the westward or to the south of these islands. These objects will occupy the ship during the month of March, after which she will return to New Zealand. The western party

will by the month of April, it is hoped, be safely established in the hut, with suitable depôts laid well south of the barrier.

During the winter preparations will be made for a great effort to reach the South Pole in the following season. The first phase of that journey must be over the plateau of the Great Barrier, the second a climb through mountain passes, and the third a traverse of a lofty inland plain. It is possible, but not probable, that any means of transport can be taken beyond the first phase. If it proves impossible then any further advance would have to be made with the unaided efforts of man alone. Shackleton's party started on the second phase with full loads, and achieved what was probably the maximum that could be accomplished in such circumstances. The only manner, therefore, in which such a record can be beaten will be by taking a larger party of men and sending sections of them back at intervals. This is, of course, a well-known expedient in Polar work, but it has to be remembered that each multiple of the original number of men only adds a fraction, and a diminishing fraction, to the radius of action. In other words, a party with the aid of a supporting party of equal numbers, can only hope to achieve a distance one-third greater than it would have done without a supporting party. Taking this fact into consideration, together with the increased risk of individual breakdown which the larger number of men must bring, it must be evident that the achievement of the South Pole, in view of the distance which had to be traversed in the second and third phases of the journey, is by no means a certainty. Captain Scott does not propose to start upon the Southern journey until the month of October. That month and the following will be spent traversing the barrier and ascending the glacier. He hopes to reach the upper plateau fairly early in December. An ideal day for reaching the South Pole would be the 22nd of that month, when the sun achieves its maximum altitude. Special four-inch theodolites have been constructed for the expedition. With such instruments, and the sun at an altitude of 23 degrees, there is no doubt that the position of the Pole could be determined within an accuracy of one mile.

Captain Amundsen's Arctic Expedition.—This expedition (*cf.* p. 206) started early in June on board the *Fram*. The leader is prepared for an absence of seven years, and in the course of his drift across the Polar sea hopes to reach open water between Greenland and Spitzbergen in 1915 or 1916. A special study is to be made of the temperature, salinity, etc., of the water of the polar basin.

Commercial Geography.

The African Palm Oil Industry.—The *Bulletin* of the Imperial Institute (vii. 4) contains a long article on this subject, which brings out some interesting points. Palm oil, which is chiefly used in manufacturing soap and candles, and in the tin-plate industry, is a product of some importance, the crude oil imported into the United Kingdom in 1908 being valued at considerably over one and a half million pounds. The

oil-palm is widely spread in Africa, but only occurs in abundance in the coast-region from Senegal to Angola, and especially from Sierra Leone to the Cameroons. The inner limit of dense forests of the palm is about 200 miles from the coast, and the tree, which is slow-growing, requires a rainfall of 50-70 inches. The chief commercial supplies of the oil are obtained from S. Nigeria, Sierra Leone, the Gold Coast Colony, Dahomey, the French Congo, the Cameroons, Togoland, and Angola, though small quantities are obtained from the east coast and from German East Africa. The wild palm is so abundant that large quantities of fruit remain ungathered, and cultivation is for the most part limited to transplanting seedlings to cleared land. The palm fruit is a collection of drupes whose fleshy portion furnishes the palm-oil of commerce, while the stone contains the kernel from which "palm-kernel oil" is extracted. The trade is in the hands of the natives, who extract the oil in the most wasteful fashion, with a loss in some cases of more than two-thirds of the product. The kernels also are obtained by the laborious process of cracking each separate nut with a stone. Different types of machinery have been devised for the extraction of the oil and the cracking of the nuts, but their costliness puts them out of the reach of the natives. A remedy for the present waste would be the establishment of central factories, but a difficulty in regard to this is that the palm is so widely distributed, and the collection of fruits carried over so wide an area, that transport to a central factory would be difficult until means of communication are improved.

The Sheep and its Products in France. — In *La Géographie* for December last, M. L. Perruchot has an interesting article on the number and distribution of sheep in France. The conditions which determine the distribution of sheep in the British Isles are very familiar, and it will be found interesting to compare the conditions in France with them.

From the map accompanying the article, it is seen that there are five regions in France which contain a large number of sheep. These are (1) the basin of Paris, (2) the west of the Central Massif, (3) the south of the Central Massif, especially the Garigues and Causses, (4) Provence and the Alps of Dauphiny, (5) the region of the Pyrenees. Two great areas, on the other hand, have very few sheep. These are the whole of Brittany and Poitou to the west, and the greater part of the extreme east. The cause is to be sought in the suitable conditions, which are much the same as those required elsewhere. Thus fertile, well-watered land cannot be profitably given over to sheep, which will not, on the other hand, flourish except on fairly dry and well-drained land, not too near the sea. This does not explain the abundance of sheep in the Paris basin. Here, however, the sheep are kept almost exclusively to furnish mutton for the towns. They are kept on farms where a variety of plants capable of being used as fodder are grown, and become sedentary animals, the farmer's one object being to fatten them as rapidly as may be for the butcher. Sugar-beet pulp and various kinds of oil-cake are extensively used for this purpose.

In France generally two distinct groups of sheep are distinguishable, the ancient races and the modern. The former, in every respect inferior to the latter, are chiefly limited to backward regions, notably the Pyrenees. The newer races come in part from the south (*e.g.* merinos from Spain) and in part from Great Britain, the latter being especially bred for mutton. As in other countries of Europe the sheep of France are steadily diminishing in number. In 1840 there were 32 millions in France, while at the end of 1907 there were only 17½ millions, a diminution of nearly one half. This is partly due, here as elsewhere, to the competition of the new countries with their vast areas of unused land, but partly to another less obvious cause. The tendency has been to the production of heavy breeds, which fatten readily and come rapidly to maturity. The annual toll of lambs killed for food is also heavy. Thus part of the diminution is apparent rather than real, and is due to the fact that the average length of life is diminished. More sheep are bred, but as they are killed at an earlier age, the figures do not show this. Among minor causes of the diminution, here as elsewhere, must be noted the increase of intensive culture, the enclosure of waste lands, and so on.

The production of home-grown wool in France is less than in the British Isles, reaching a total of 43,000 tons in 1907. This represented only one-fifth of the raw material required that year for the French manufacture of wool. The chief countries from which additional supplies are obtained are, in order of importance, South America, Australia, the Mediterranean countries.

As to mutton, the French sheep supply nearly but not quite all the demands of the country. A very curious fact is the steady diminution in the amount of mutton used in the sheep-rearing districts. Everywhere this diminution is noticeable, and in the Ardennes, for example, mutton is practically not eaten by the country people. On the other hand the demand of the towns is steady. The result is that the sheep industry is dividing itself into two distinct divisions. The sheep are reared in the country districts, and then transferred to centres near large towns, where the fattening both of lambs and sheep is practised as an independent industry.

In some parts of the country cheese is manufactured from sheep's milk, but except in the case of Roquefort, which is especially exported to the United States, this does not enter the world's market.

General.

The Tenth International Geographical Congress.—We have received the preliminary circular announcing the arrangements which are being made for this Congress, which is to be held at Rome from October 15-22, 1911. As a reference to vol. xxiv. p. 536 will show, the exact date of the Congress was left to be settled by the local committee at Rome, and the circular states that the particular date has been chosen because the season is then suitable, while there will not be such a crowd of tourists within the city as to interfere with the work of the Congress. At the same time the fact that festivities commemorating the

proclamation of the kingdom of Italy are being carried on, will add to the interest of the visit. It is to be feared, however, that the date is not quite the most suitable for British delegates, as most universities and colleges here have begun their winter's work by the middle of October.

A programme of excursions is to be arranged in Rome and the neighbourhood, and the members of the Congress are to have tickets at reduced fares on the state railway lines in Italy, and also on those steamers which receive a state subsidy. They are also to be allowed access to the museums, galleries, and public monuments at Rome without payment, on showing their tickets of membership. The President of the Congress is the Marchese Raffaele Cappelli, the president of the Italian Geographical Society, and the secretary is Commander Giovanni Roncagli, the general secretary of the society. Requests for membership forms, or for further information, should be addressed to the Secretariat, Via del Plebiscito 102, Rome.

Zoological Society of Scotland.—The Society has been presented with a number of copies of the first annual report of the Zoological Society of Scotland, which have been placed upon the tables in the library for the use of members. It may not perhaps be generally known that one of the objects of this young society is to establish and carry on zoological gardens in Scotland, beginning with a zoological garden in Edinburgh as the capital. To render this possible a considerable measure of public support is necessary, and we gladly take the opportunity of calling the attention of our members to this very laudable object. As it seems clear that many persons are unaware of the great improvements which have been made recently in methods of keeping wild animals alive and healthy in confinement, and in rendering the parks or gardens in which they are kept artistic and interesting, a considerable amount of space is devoted in the report to a description of Herr Hagenbeck's zoological garden at Hamburg, the account being illustrated by some attractive photographs. In addition there are some other interesting photographs, obtained from various sources, and well adapted to stimulate a desire to see the beautiful animals which they depict in the living condition, instead of only as stuffed museum specimens. We offer the Zoological Society our best wishes in its efforts to promote public interest in wild animals, and public sympathy with them in the fate which is so rapidly overtaking many in the so-called "advance of civilisation." Only by an increase in this public sympathy can the larger forms be saved from rapid and complete extermination.

Prize Essay in Geography at Edinburgh University.—The following subject has been announced for the essay for which a silver medal (*cf.* vol. xxv. p. 202) is to be given this year by the Royal Scottish Geographical Society—"A Geographical Description of any County of Scotland except the smaller ones." If Midlothian is chosen, West Lothian must be associated with it. The counties of Kinross and Clackmannan must be associated with Fife, Cromarty with Ross, and

Nairn with Elgin. The essay is open for competition to all students who have attended the ordinary course in geography at Edinburgh University. Essays must be sent to the lecturer at the University not later than Monday, October 17, 1910. As before, intending candidates may consult books and maps at the rooms of the Society at all hours at which they are open, and, till September 30, through the kindness of Dr. Horne, Director of the Geological Survey of Scotland, they will be permitted to consult, at the office of the Survey, 33 George Square, some unpublished sheets of the map of Scotland, on the scale of 4 miles to the inch, showing the drift geology.

Causation of Pellagra.—We noted here (p. 152) the announcement of the formation of a Committee for the study of this disease, which is spreading fast in the United States of America and in some British Colonies. Dr. Sambon, who is studying the subject at present under the Committee in Italy, announces that he has definitely proved that it is the growers rather than the consumers of maize who suffer from the disease, and that the consumption of maize is not the cause of it. He has also found presumptive evidence that it is, as previously suggested, a kind of sand-fly which acts as the carrier of the parasite producing the disease, the name of the fly being *Simulium reptans*.

EDUCATIONAL.

As already announced here, a meeting of teachers and others interested in education was held in the Society's rooms on May 26 to hear an address, given by Mr. G. R. Gill, F.R.G.S., on his Earth Model, and to see a specimen of the model fitted up. Mr. G. G. Chisholm was in the chair, and there was a large attendance.

On p. 274 we have already given some account of the Model and of its method of construction, so that it is not necessary to describe this. In the course of his remarks Mr. Gill said he had been working for thirteen years at the Model, and there were certain points in its construction which he had tried to improve further, but without success. He invited criticism, however, from teachers in regard to what might appear to them to be defects from their special point of view. He explained that his motive in constructing the globe had been especially to aid children in the always difficult task of learning to read a map, and to understand how a portion of a sphere came to be represented on the flat surface of a map.

In addition to the political, physical, and blank globes already described, Mr. Gill showed that paper sections could be supplied at very small cost, on which teachers could draw any form of coastline, etc., which they wished to have. If such sections were sent to the makers any form of surface plate could be supplied based upon the teacher's drawings.

In reply to a question from a member of the audience, Mr. Gill

explained that the globe could be made to rotate in either direction, east to west, or west to east. He showed also that by the addition of an extra fitting, representing the Plough and the Polestar, direction could be taught.

Mr. Gill's address was followed by a few remarks from Mr. Chisholm, who pointed out that from the teacher's point of view the essential point was the price of the globe when it came to be put upon the market commercially. If the cost were not prohibitive he thought that a considerable number of different points in the teaching of geography could be made clear by means of it, though in his opinion no globe could ever entirely replace the use of flat maps in geographical teaching.

In response also to Mr. Gill's request for criticism from the teacher's point of view, Mr. Chisholm referred to the physical globe, on which the land area is pure white. He suggested that this globe would be more effective and more useful to the teacher if orographical colouring were employed, so that the great altitudes and the area of low elevation would stand out clearly.

In reply Mr. Gill indicated that such colouring would add considerably to the cost of the globe, and without naming any probable price he left the impression that the entire model must necessarily be a somewhat costly piece of apparatus.

Mr. Gill was cordially thanked by the audience for his kindness in coming to Edinburgh to demonstrate his very interesting model.

NEW BOOKS.

EUROPE.

Edinburgh and District: an Introduction to Geography. By T. S. Muir, M.A., F.R.S.G.S., Geography Master, Royal High School, Edinburgh. Edinburgh: W. and A. K. Johnston, 1910. *Price* 1*s.* 6*d. net.*

"This little book is intended, not as a comprehensive treatise on Edinburgh, but as a guide to the city and neighbourhood for beginners in Geography. It is an outline sketch to be completed by the pupils with the help of the teacher. That is to say, it was the author's idea to make it suggestive rather than informative; and, therefore, instead of facts to be learned, there are blanks to be filled in." The book is an excellent example of the local application of practical geography, and with it a well-equipped teacher should be able to arouse in his pupils a keen interest in the city and neighbourhood. In a baker's dozen of chapters the book deals with some preliminaries about direction, scales, and maps, and makes excursions through different parts of the place, drawing the appropriate lesson from each locality, and enforcing these lessons with an apparatus of questions and exercises, some of them of an ingeniously stimulating and suggestive character.

While the selection of material for such a book must be largely personal to the author, we are glad to find ourselves almost entirely in accord with the present one. Of course large additions could be made; we should, for instance, like to see a reference to the glaciated rock surface on the Queen's Drive, and to the frequent occurrence of glaciated pebbles among the old moraine matter of the

district. But probably one of the most valuable results of the use of the book will be the demand on the part of the pupils for such additions—hence the need for the well-equipped teacher.

We note but few points that need correction: "Scot's Grey" for "Scots Grey" is a curious misprint (p. 40); the Old University Buildings on the South Bridge are not properly styled "Old University" (p. 55), as there is but one University in the city; the ditch at the entrance to the Castle never contained water (p. 35); and the glaciated rock surface on the south side of Blackford Hill is not a boulder (p. 99).

We strongly recommend the book to the notice of the teachers of the district; it should prove very helpful and enjoyable to them and to their pupils.

Cambridgeshire. By T. M'Kenny Hughes and Mary Caroline Hughes. (Cambridge County Geographies.) Cambridge: At the University Press, 1909. *Price* 1*s.* 6*d.*

We reviewed here (vol. xxv. p. 658) an earlier member of this series, and the description there given of the general features holds good in all essential points for the present volume, of which the ground-plan is the same. Like the previous volume the present one is very nicely got up, having many illustrations, some of which are very good, two coloured maps, one topographical and one geological, and some sketch maps, diagrams, etc. It contains a great deal of information, both of a local and of a general nature. We note that the authors include some discussion of general problems, *e.g.* of the Ice Age. This doubtless renders this particular book more suited for school use, but gives rise to difficulties if the same plan is adopted in each volume. We are disposed to think that such general questions should be omitted from studies of the home region, for they are more conveniently studied in general text-books, which the teacher at least is bound to possess in addition. But this is a matter of opinion, and there is no doubt that the series, as exemplified by the volumes which we have seen, is a valuable addition to geographical literature.

Cornwall. By S. Baring-Gould. (Cambridge County Geographies.) Cambridge: At the University Press. 1910. *Price* 1*s.* 6*d.*

We have nothing but praise for this Geography of the Duchy, which fully maintains the high standard of the County Series. Mr. Baring-Gould is a well-known authority on Cornwall, and he has evidently approached his task with an enthusiasm worthy of the subject. The illustrations are carefully chosen and clearly reproduced, and the book is really wonderful value for the money. We look forward to the time when this series will be extended to Scotland. It is now a commonplace that a child should approach the study of Geography by being taught to observe his own surroundings, but it is no less true that, after having surveyed the world at large, he should return to his own district, and by a close scrutiny, endeavour to discover its true relation to the whole country and to the world. The latter part of this scheme is made possible of accomplishment by the Cambridge Series.

Since the two reviews above were written we have received, as our list of *Books Received* for the present month shows, all the remaining published volumes of the Series. We shall therefore reserve any further notice of the volumes until the completion of the whole Series.

ASIA.

The Gates of India. By Colonel Sir Thomas Holdich, K.C.M.G., K.C.I.E., C.B., D.Sc. London: Macmillan and Co., Limited, 1910. *Price* 10*s. net.*

We presume it is unnecessary to remind our readers that Sir Thomas Holdich is no stranger to the Royal Scottish Geographical Society. He is the author of several acceptable works which have been reviewed from time to time in the pages of this magazine, and in December 1903 he delivered to the Society a masterly address on the "Patagonian Andes." His experience and his fame as an explorer and geographer have been earned in both hemispheres, and the interesting volume now before us cannot fail to enhance his already great reputation. It appeals to the geographer, the antiquarian, the ethnologist, the soldier and the politician, both of Great Britain and of many countries in Europe and in Asia. The author tells us that it is the result of twenty years' observations, for which he has had unique opportunities in connection with his professional work as an engineer on the North-Western frontiers of India, and more especially in connection with the Commission for the delimitation of the Afghan frontier; and it is very obvious that he has prepared for it by a conscientious and sympathetic study of the records and works of his many predecessors. He has thus brought to bear on his subject many exceptional qualifications; he has studied the problem of the *Gates of India* as it has been stated and more or less solved in the past; he has studied it as it exists to-day and he has been able to study it *on the spot*; he has brought to the study long and varied experience as a soldier, an engineer, a diplomatist, and an official well versed in the complicated and tortuous ways of the strange, many-sided, semi-barbarous, unscrupulous chiefs and inhabitants of Afghanistan. Not many years ago a work on the *Gates of India* from such an expert could not have failed to excite unusual interest, and if Sir Thomas Holdich had been an alarmist he might easily have created a tremendous sensation. Just at present, however, the subject can be discussed calmly and exhaustively in the light of past and present knowledge, and this is what Sir Thomas has now done. He is no alarmist; nor is he a quietist. He marshals the facts so far as they are known, and discusses, dispassionately but convincingly, such questions as what gates, *i.e.* passes, of India may be set aside as useless for the purpose of attack, and what require our constant attention; and the inference is too obvious to be missed. He does not assert that all the conditions of the problem are even now so thoroughly known that a final decision as to its solution is ready or even possible. He takes the facts as they have been demonstrated by history and geography, and deduces clearly and temperately results which will go far to enlighten and reassure public opinion, and which will doubtlessly receive what they deserve, viz. the gravest study and attention of the political and military authorities at home and in India.

"The geography of a country shapes its history just as surely in the East as in the West," and in this book we have many illustrations of this truth. More than this, we have numerous instances of where doubts and difficulties suggested by ancient histories and modern records have now been cleared up and solved by recent and accurate knowledge of the geography of the region in question. For example, students of the campaigns of Alexander the Great, puzzled by ambiguous or contradictory passages in Arrian or Curtius or Strabo, will find many of their difficulties illuminated, if not solved, by the fresh light thrown on the ancient narratives by recent research. Indeed one of the most important services of this book is to show how the problems of history are illuminated by geography.

For the antiquarian and ethnologist Sir Thomas provides plenty matter for

serious study. History relates how in former days there was a more or less constant stream of emigration—sometimes forced—from the West to the East. "From time immemorial in Asia it had been customary for the captives taken in war to be transported bodily to another field for purposes of colonisation and public labour. When the world was more scantily peopled such methods were natural and effectual." Conquering kings like Alexander left colonies of soldiers here and there as military or administrative policy suggested. "There is nothing," Sir Thomas justly remarks, "more astonishing in the fact that we should find a powerful people claiming descent from Israel in Northern Afghanistan than that we should find another people claiming a Greek origin in the Hindu Kush." Pressure of circumstances and nomadic habits have caused, and still cause, much shifting and changing of the population, and every such shift and change has more or less permanent effects, which, however, are by no means obvious at the present day. We extract a passage from this book as an illustration of what we have said, the more willingly as it affords a good example of the rich and ornate style :—"The Oxus, to the north of Balkh, is well known, and the fords and passages of that river have been reckoned up with fair accuracy. From time immemorial every horde of Skythic origin, Nagas, Sakas, or Jatas, must have passed these fords from the hills and valleys of the Central Asian divide on their way to India. The Oxus fords have seen men in millions making south for the valleys of Badakshan and the Golden Gates of Central Asiatic ideal which lay yet further south beyond the grim line of Hindu Kush. Balkh (the city) must have stood like a rock in the human tide which flowed from north to south. From the west, too, from Asia Minor and the Persian provinces, as well as from the Caspian steppes to the north-west, must have come many a weary band of tear-stained captives, transported across half a continent by their conquerors to colonise, build cities, and gradually amalgamate with the indigenous people, and so disappear from history. From the west came Parthians, Medes, Assyrians, and Greeks, who did not altogether disappear. But no such human tide ever flowed into Badakshan from the east nor yet from the south. To the east are the high barriers of the Pamirs. No crowd of fugitives or captives that we know of ever faced these bleak, inhospitable, wind-torn valleys. Nor can we find any trace of emigration from India. Yet routes were known across the Pamirs, and in due time, as we have seen, small parties of pilgrims from China made use of these routes, seeking for religious truth in Balkh when, as a Buddhist centre, Balkh was in direct connection with the Buddhist cities of Eastern Turkestan. And Buddhism itself, when it left India, went northward and flourished exceedingly in these same cities of the sandy plain, where the people talked and wrote a language of India for centuries after the birth of Christ. Balkh, however, never stayed the tide which overlapped it, and, passing on, lost itself in the valleys under the Hindu Kush, or else, surmounting that range, streamed over into the Kabul basin. Whether the tide set in from north or west, the overflow was forced by purely geographical conditions into precisely the same channels, and in many cases it drifted into the hills and stayed there. What we should expect to find in Balkh, then whenever Dr. Stein can get there are records in brick, records in writing, and records in coin, of nearly every great Asiatic movement which has influenced the destinies of India from the days of Assyria to those of Mohamed. What a history to unfold!"

A very pleasing feature of this book is the way in which Sir Thomas speaks of those who have gone before him in the work of exploration. For the American Masson he has unqualified praise; he is cordial in his appreciation of the good work of men like Christie, Pottinger, and Barnes; and he has a good word to say for even the volatile Frenchman, Ferrier. But enough has been said to recommend

this work to our readers. We have only to add that the maps which accompany it are excellent.

A Journal from Japan. A Daily Record of Life as seen by a Scientist. By Marie C. Stopes, D.Sc., Ph.D., F.L.S. London: Blackie and Son, Ltd., 1910. *Price 7s. 6d. net.*

The Japan of to-day is too evidently not the Japan of yesterday; but even while deploring the gradual westernisation Dr. Stopes is able to give us some delightful glimpses of its own original life. During eighteen months' residence in Tokio, with occasional excursions into the country, she found time to make many acquaintances and to see many things; but whether describing an interview with some learned professor, a visit to some old temple, or to the home of Lafcadio Hearn (for whose work, by the way, she has a great admiration), her pen is always sympathetic.

The work of a lady scientist who went to Japan with a distinct object in view, the "journal" takes the form of a simple diary sent home to friends in this country and not originally intended for publication. Thus it has, as Dr. Stopes herself says, the merit of recording facts, not mere generalities; and any student of things Japanese could not do better than peruse its pages. He will doubtless suffer some disillusionments. To quote a minor instance, it is distressing to find that the word "jinrickshaw" is only understood in Europeanised places, and that the real name for the vehicle in question is "kuruma"; but he will be well repaid by the evident knowledge with which the book is written, coupled with its delightful sense of humour and of artistry.

To old students of the University of London the book should have an added interest in that Dr. Stopes is the founder of the London University Union in Japan.

AFRICA.

South Africa. By Ian D. Colvin. "Romance of Empire Series." London: T. C. and E. C. Jack, 1909. *Price 6s. net.*

This is a brightly written account, illustrated by twelve coloured plates and a poor sketch map, of the region of South Africa from early times till the peace after Majuba. Like the other members of the same series it is historical rather than geographical. The author has a good deal to say in criticism of Dr. Theal's work, which we reviewed rather fully here (see p. 86) on the appearance of a third edition, and those who are interested in the subject may like to study another point of view as presented by Mr. Colvin.

AMERICA.

La République Argentine. Par H. D. Sisson. Deuxième Édition. Paris: Plon, Nourrit et Cie, 1910. *Prix 3 fr. 50.*

M. Sisson is entitled to a respectful hearing on the subject of Argentina. He has spent some fifteen years there, and it is obvious that he has made a conscientious and exhaustive study of its history and social and economic conditions. He writes unmistakably from the French point of view, but he is calm and evidently anxious to be impartial in the opinions he expresses. The limits of space have required him to condense ruthlessly. For example, he has had to compress into less than a hundred pages the history of a country six times the size of France, which during the last century has been the scene of countless revolutions. The most interesting part of the work is his appreciation of the social conditions

of Buenos Aires and the Argentine generally; and we trust we do not misrepresent him if we say that he has grave apprehensions for the future. These are based on the system of education, forced on the country by the Government, from which all traces of religion have been rigorously excluded; and also on the character of the people, the result of their mixed origin, their stormy history, their extraordinary wealth, their idleness and want of what we may call moral ballast. The social and commercial relations between France and Argentina are already very pronounced and are growing. Something like thirty-two millions sterling of French capital is sunk in Argentina: the imports from France, which in 1902 were under two millions, in 1906 had risen to five and a half millions sterling. M. Sisson calculates that seventy-five out of every hundred books read in Argentina, or at least in Buenos Aires, are French; and he says that society in Argentina dresses and eats in the French fashion, drinks French wines, and buys French works of art. The general results, however, are not wholly commendable. But it is clear that Argentina is only now in the initial stage of its history, and when the age of revolutions has passed it will, with its unlimited natural resources and wealth, take and keep a great position in South America.

GENERAL.

The "Queen" Newspaper Book of Travel: A Guide to Home and Foreign Resorts. Compiled by the Travel Editor (M. Hornsby, F.R.G.S.). With Maps and Illustrations. Seventh Year. London: Horace Cox, 1910. *Price* 2*s.* 6*d. net.*

This guide has been enlarged by the addition to the present issue of information in regard to Canada, Australia, United States, winter resorts, West Africa, and so on. The enormous range makes the articles devoted to any particular area necessarily short, but most are so concise that all essential information is included. An excellent feature is the inclusion of a bibliography, with full details as to the more useful guide-books, etc. We think a few notes on maps might be added to this list. Otherwise we have nothing but praise for this excellent and very cheap little book.

BOOKS RECEIVED.

Cambridge County Geographies. Edited by Dr. F. H. H. Guillemard. Crown 8vo. Cloth. *Price* 1*s.* 6*d.* Cambridge: University Press, 1910.

Cheshire. By T. A. Coward. *Devonshire.* By Francis A. Knight and Louie M. Knight Dutton. *Essex.* By George F. Bosworth, F.R.G.S. *Gloucestershire.* By Herbert A. Evans, M.A. *Hertfordshire.* By R. Lydekker. *Kent.* By George F. Bosworth. *Norfolk.* By W. A. Dutt. *Somerset.* By Francis A. Knight. *Suffolk.* By W. A. Dutt. *Surrey.* By George F. Bosworth. *Sussex.* By George F. Bosworth. *Wiltshire.* By A. G. Bradley.

The Senior Scientific Geography. By Ellis W. Heaton, B.Sc., F.G.S. Cr. 8vo. Pp. 861. *Price* 5*s. net.* London: Ralph, Holland and Co., 1910.

Some Sylvan Scenes near Glasgow. By T. C. F. Brotchie, F.S.A. (Scot.). With 90 Illustrations in Pencil, Pen, and Ink by the Author. Cr. 8vo. Pp. 164. *Price* 1*s. net.* London: Aird Coghill, Ltd., 1910.

Sicilian Ways and Days. By Louise Caico. With 128 Illustrations.

Demy 8vo. Pp. xvii + 279. *Price* 12*s.* 6*d. net.* London: John Long, Ltd., 1910.

Glimpses of East Africa and Zanzibar. By Ethel Younghusband. With 54 Illustrations from Photographs and a Map. Demy 8vo. Pp. xvi + 320. *Price* 12*s.* 6*d. net.* London: John Long, Ltd., 1910.

A Laboratory Manual of Physical Geography. By Professor R. S. Tarr and O. D. von Engeln. For use in connection with a general course in Physical Geography in High and Secondary Schools and in Colleges. 4to. Pp. xvii + 362. New York: The Macmillan Co., 1910.

Linlithgow Palace: Its History and Traditions; With Peeps from its Windows at the Burgh and Surrounding District. By the Rev. John Ferguson, D.D., F.S.A. (Scot.). Imp. 8vo. Pp. xxviii + 369. *Price* 10*s.* 6*d. net.* Edinburgh: Oliver and Boyd, 1910.

Edinburgh and District: An Introduction to Geography. By T. S. Muir, M.A., F.R.S.G.S. Cr. 8vo. Pp. 108. *Price* 1*s.* 6*d. net.* Edinburgh: W. and A. K. Johnston, Ltd., 1910.

Elements of Geography and of Natural and Civil History. By John Walker. Demy 8vo. Pp. xvi + 671. London, 1805. Presented by Mrs. Keith Young.

An Enlarged Gazetteer of Scotland. By John Parker Lawson, M.A. Cr. 8vo. Pp. 960. The Edinburgh Printing Co., 1841. Presented by Mrs. Keith Young.

Argentina (South American Series). By W. A. Hirst. With an Introduction by Martin Hume, M.A. Demy 8vo. Pp. xxviii + 308. *Price* 10*s.* 6*d. net.* London: T. Fisher Unwin, 1910.

John Bull's Land Through a Telescope. By A Canadian. Cr. 8vo. Pp. 205. *Price* 3*s.* 6*d.* London: Henry J. Drane, 1910.

The Commercial Handbook of Canada. Sixth year. 1910. Edited by Ernest Heaton, B.A., and James Beverley Robinson. Cr. 8vo. Pp. xxxi + 451. *Price* 5*s.* Toronto: Heaton's Agency, 1910.

Résultats du Voyage du S.Y. Belgica en 1897-1898-1899, *sous le commandement de A. de Gerlache de Gomery. Rapports Scientifiques.* Anvers: Expédition Antarctique Belge, 1909.

Highways and Byways in Buckinghamshire. By Clement Shorter. With Illustrations by Frederick L. Griggs. Extra Cr. 8vo. Pp. xix + 344. *Price* 6*s.* London: Macmillan and Co., 1910.

Bei den Eskimos in Westgrönland. Ergebnisse einer Sommerreise im Jahre 1906. Von Dr. Rudolf Trebitsch, nebst einem Ethnologischen Anhang von Dr. Michael Haberlandt. Mit 62 Abbildungen auf 27 Lichtdrucktafeln und 1 Karte. Royal 8vo. Pp. xxiii + 162. *Price* 8 *m.* Berlin: Dietrich Reimer, 1910.

Cook's Handbook for Tourists to Peking, Tientsin, Shan-Hai-Kwan, Mukden, Dalny, Port Arthur, and Seoul. With Maps, Plan and Illustrations. Cr. 8vo. Pp. 116. London: Simpkin, Marshall, Hamilton, Kent and Co., Ltd., 1910.

A Corner of Spain. By Walter Wood. With an Introduction by Martin Hume. Illustrated by Frank H. Mason, R.B.A. Crown 8vo. Pp. xii + 203. *Price* 5*s. net.* London: Eveleigh Nash, 1910.

Basis of Evaporation: Temperature of the Sea around the British Isles and Notes on the Climate of Ireland. By Richard Strachan. Demy 8vo. Pp. 70. *Price* 4*s.* London: Williams and Strahan, 1910.

In Lotus-Land Japan. By Herbert G. Ponting, F.R.G.S. With 8 Illustrations in Colour, and 96 in Monochrome from Photographs by the Author. Cr. 4to. Pp. xvi + 395. *Price* 21*s. net.* London: Macmillan and Co., Ltd., 1910.

The Diary of a Soldier of Fortune. By Stanley Portal Hyatt. Illustrated. Demy 8vo. Pp. vii + 359. *Price* 12*s.* 6*d. net.* London: T. Werner Laurie, 1910.

The Subantarctic Islands of New Zealand. Reports on the Geo-Physics, Geology, Zoology, and Botany of the Islands lying to the South of New Zealand. Edited by Chas. Chilton, M.A., D.Sc., F.L.S. Published by the Philosophical Institute of Canterbury, in two Volumes. Demy 4to. Pp. xxxv + 848. *Price* 42*s. net.* London: Dulau and Co., Ltd., 1909.

Germany of the Germans. By Robert M. Berry. With over 30 Full-page Plate Illustrations. Cr. 8vo. Pp. vii + 278. *Price* 6*s. net.* London: Sir Isaac Pitman and Sons, Ltd., 1910.

Alpine Profile Road Book of Switzerland and Adjacent Portions of the Tyrol, and the Italian Lake District. Compiled and edited by R. H. U. Ellis, C.T.C. Oblong 8vo. Pp. 148. London: Thomas Nelson and Sons, 1910.

Distant Lands: An Elementary Study in Geography. By H. J. Mackinder, M.A. With 210 Illustrations and 12 Coloured Maps. Cr. 8vo. Pp. xvi + 296. *Price* 2*s.* London: George Philip and Son, Ltd., 1910.

Rambles in Many Lands. By John Mackenzie. Cr. 8vo. Pp. 167. Inverness: The Northern Counties Newspaper Co., Ltd., 1910.

The Book of Arran. Edited by J. A. Balfour, F.R.Hist.S., F.S.A. (Scot.). Archaeology. 4to. Pp. xiv + 295. *Price* 21*s. net.* Glasgow: Hugh Hopkins, 1910.

District Gazetteers of the United Provinces of Agra and Oudh: Pilibhit, by H. R. Nevill, I.C.S., F.R.G.S., F.S.S., M.R.A.S.; and *Banda*, by D. L. Drake-Brockman, I.C.S. Allahabad, 1909.

Bengal District Gazetteers: Howrah. By L. S. S. O'Malley and Monmahan Chakravarti. Calcutta, 1909.

Punjab District Gazetteers: Ludhiana District and Maler Kotla State Statistical Tables, 1904; *Jhelum District Statistical Tables*, 1904; and *Rawalpindi District, with Maps*, 1907. Lahore, 1909.

Central Provinces District Gazetteers: Jubbolpore District; and *Chanda District*, by L. F. Begbie. Edited by A. E. Nelson. Bombay, 1909.

Geographen-Kalendar. In Verbindung mit vielen Fachgenossen herausgegeben von Dr. Hermann Haack. Achter Jahrgang, 1910. Cr. 8vo. Pp. xxx + 737. Gotha: Justus Perthes, 1910.

Svenska Turist-Föreningens Årsskrift, 1910. Pp. viii + 462. Demy 8vo. Stockholm: Wahlström and Widstrand, 1910.

Catalogue of the War Office Library. Part ii. Demy 8vo. London, 1906.

The Relation of Geology to Topography. By Douglas Wilson Johnston and François E. Matthes. Pp. 246-266. New York: John Wiley and Sons, 1910.

The City of Jerusalem. By the Rev. J. Anderson Watt, F.R.G.S. Pp. 30. *Price* 2*d.* Glasgow: The Northern British-Israel Council, 1910.

Synopsis of the Results of the Operations of the Great Trigonometrical Survey of India. (Series i. of the N. E. Quadrilateral.) Prepared under the direction of Colonel S. G. Burrard, R.E., F.R.S. Published under the order of Colonel F. B. Longe, R.E. *Price* 5 *rupees.* Dehra Dun, 1909.

Report of the Seventy-ninth Meeting of the British Association for the Advancement of Science. Winnipeg, 1909. August 25 to September 1. Demy 8vo. Pp. cxliii + 935. London: John Murray, 1910.

The Hispar Glacier. 1. *Its Tributaries and Mountains.* By Fanny Bullock

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[*Photo by A. Swan Watson.*

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COMMANDER PEARY, LL.D., and VICE-CHANCELLOR SIR WILLIAM TURNER, K.C.B., M.D., D.Sc., LL.D., D.C.L., etc., in the Quadrangle of Edinburgh University, May 23, 1910.

THE SCOTTISH GEOGRAPHICAL MAGAZINE.

PEARY ARCTIC CLUB EXPEDITION TO THE NORTH POLE, 1908-9.[1]

By Commander Robert E. Peary, LL.D.

(With Illustrations.)

The last North Polar Expedition of the Peary Arctic Club[2] left New York Harbour on July 6, 1908, in the steamer *Roosevelt*, built by the club especially for Arctic work, and commanded by Captain Robert A. Bartlett.

The members of the expedition were as follows: Commander R. E. Peary, U.S.N., Commander of the expedition; Captain R. A. Bartlett, master S.S. *Roosevelt*; Chief Engineer George A. Wardwell; Surgeon J. W. Goodsell; Assistants: Prof. Ross G. Marvin, Prof. D. B. MacMillan, George Borup, M. A. Henson; Charles Percy, steward; William Pritchard, assistant steward: Thomas Gushue, mate; John Murphy, boatswain; Seamen: John Coady, John Barnes, John Thomas, Denis Murphy, George Percy: Banks Scott, second engineer: Firemen: James Beatty, Patrick Joyce, Patrick Straus, John Wiseman: making a total of twenty-two persons.

At Oyster Bay, Long Island, the ship was inspected and the expedition reviewed by President Roosevelt, and then steamed out for Sydney, Cape Breton. At Sydney the *Roosevelt* was filled completely with coal, and some last items of supplies were taken on board. I joined the expedition here, and on July 17 the *Roosevelt* steamed out and headed northward.

Proceeding across the Gulf of St. Lawrence, through the Straits of Belle Isle to Hawkes Harbour, Labrador, we met the auxiliary steamer.

[1] An address delivered before the Society in Edinburgh, on May 24, 1910.

[2] The officers of the Peary Arctic Club are General Thomas H. Hubbard, President; Zenas Crane, Vice-President; and Herbert L. Bridgman, Secretary and Treasurer.

Erik, loaded with coal and whale meat. From here the two ships steamed north in company, passing along the southern portion of the Labrador coast; thence we steamed through Davis Strait, Baffin and Melville Bays, without calling at any of the Greenland ports, and reached Cape York on August 1.[1]

In the Cape York-Etah region, a little less than three weeks were spent in selecting the best of the Eskimos to accompany me north, in purchasing dogs, furs, and other items of equipment, in killing walrus, and in re-filling the *Roosevelt* with coal.

On August 18 the *Roosevelt* steamed out of Etah to resume her voyage north, the *Erik* returning home from this point. I had on board at this time 22 Eskimo men, 17 women, 10 children, 246 dogs, and some 40 odd walrus. Two of my men, the boatswain and the cabin boy, had been left at Etah in charge of the relief station, thus reducing the number of the ship's party to twenty, and making a total of sixty-nine souls on board.

The negotiation of the ice-encumbered channels from Etah northward to the northern coast of Grant Land, which I had in view again for winter quarters of the ship, was very similar to its navigation on the previous expedition three years before; the time occupied was almost identical, but the nervous strain, and the risk and danger to the ship were distinctly less as the result of our greater experience.

Leaving Etah we proceeded, as usual, to Cape Sabine, forced our way, with frequent delay and interruption, through the usual heavy ice, past Cape Albert and Victoria Head; worked along under the Cape D'Urville-Hayes Point coast, then off Cape Fraser met clear water, which enabled us to steam north in the middle of the channel to Lady Franklin Bay. Here the ice forced us across to the Greenland coast at Thank God Harbour, whence we worked up past Cape Lupton, and from there north to Cape Union. From here we were drifted south some distance, but later took refuge under the north shore of Lincoln Bay, in nearly the identical place where we had our unpleasant experience three years before. Here we remained for several days, during a period of constant and at times violent north-easterly winds. Twice we were forced aground by the heavy ice; we had our port quarter-rail broken, and a hole stove in the bulwarks; and twice we pushed out in an attempt to get north, but were forced back each time to our precarious shelter.

Finally, on September 2, we squeezed around Cape Union and made fast in a shallow niche in the ice-foot; then after some hours we made another short run to Black Cape, and hung on to a grounded bit of ice. At last, a little after midnight on September 4, we passed through a stream of extremely heavy running ice into open water, rounded Cape Rawson, and passed Cape Sheridan within a quarter of an hour of the same time we arrived three years before (7 A.M., September 5).

[1] The general direction of Commander Peary's voyage is shown on the map which we published here in vol. xxv. p. 535. Fuller details are given on the larger map which accompanies the description of the 1900-2 expedition (see vol. xix. p. 672).—ED. *S.G.M.*

An attempt was made to force the ship into Porter Bay under Cape Hecla for winter quarters, but this was given up, and a place selected close to the delta point of the Sheridan River, a little north of our previous winter quarters. Here the *Roosevelt* was forced into shallow water, unloaded and carefully secured. Tidal observations were commenced at once, and the members of the crew constructed box houses on the shore as an emergency precaution; the members of the expedition, with the Eskimos, began the transportation of supplies westward to Cape Columbia. This work, alternating with hunting, consumed the remainder of the time until November, at which time a large amount of supplies had been transported to Cape Columbia, and to intermediate depôts at Cape Colon and Parry Peninsula.

The trail to Columbia crossed both Fielden and Parry Peninsulas. During this time I reconnoitred Clements Markham Inlet, making the entire circuit of its shores.

The winter months were fully occupied on board the *Roosevelt* in making the equipments, sledges, harnesses, clothing, etc., for the sledge journey, and in the field during the period of moonlight in each month, in hunting, in tidal observations at the outer stations, and in continuing the work of transporting supplies to Cape Columbia.

The expedition was perhaps unique in the amount and range of its winter sledge-work. Cape Columbia to the north-west, Cape Bryant to the north-east, the head of Newman Bay to the south-east, and Lake Hazen to the south-west marked the sphere of this action. A month's tidal observations were taken by MacMillan at Cape Columbia; another month by Marvin at Cape Bryant (both simultaneous with observations at Sheridan); Robeson Channel was crossed four times in the depth of winter, and the work had its desired and intended effect of keeping the members of the expedition, the Eskimos, and the dogs in the best of training, so that when the spring campaign opened they were hard and fit.

On February 15 Bartlett left the *Roosevelt* with the first division of the northern sledge party. Other members of the party followed on successive days with their division, and I brought up the rear on the 22nd with my division. Seven members of my party, 19 Eskimos, 140 dogs, and 28 sledges had now left the ship.

Four months of northerly winds at Cape Sheridan during the fall and winter, instead of southerly ones as during the previous season, led me to expect less open water than before, but a great deal of rough ice, and I was prepared to hew a road through the jagged ice for the first hundred miles or so from Columbia to across the "big lead," and had massed provisions at Columbia for this purpose.

On the last day of February, Bartlett, with his pioneer division, accompanied by Borup and his division, got away due north over the ice, and on March 1 the remainder of the party got away on Bartlett's trail, I following an hour later.

The party now comprised 7 members of the expedition, 17 Eskimos, 133 dogs, and 19 sledges. Two Eskimos and seven dogs had gone to pieces. My marching formation for the expedition contemplated a lightly loaded,

energetic advance or pioneer party, breaking a trail one day in advance of the main party: a compact main party, made up of unit divisions of four men each; and supporting parties, returning at intervals.

A strong easterly wind, drifting snow, and temperature in the minus fifties marked our departure from the camp at Cape Columbia, which I had christened Crane City. Rough ice in the first march damaged several sledges and smashed two beyond repair, the teams going back to Columbia for other sledges in reserve there. At the end of the fourth march, about forty-five miles north of Columbia, we were held up six days by the "big lead" which marks the edge of the continental shelf. At noon on March 5, the sun, red and shaped like a football by excessive refraction, just raised itself above the horizon for a few minutes, and then disappeared again. Beyond the "big lead," at the end of the seventh march, 84° 29′ N. lat., Dr. Goodsell, MacMillan, and three Eskimos, with three sledges and teams, returned.

The best Eskimos, sledges, and dogs were retained by the main party, and their sledge loads brought up to the standard. A sounding here gave a depth of 825 fathoms. On leaving this camp the expedition comprised 16 men, 12 sledges, and 100 dogs.

The next five marches (three short ones with Henson in the lead, with some rough ice and several broken sledges, and two with Marvin in the lead) brought us to 85° 23′.

From this point Borup turned back in command of the second supporting party. Here again, as before, the best Eskimos, dogs, and sledges were retained for the main party, and the loads brought up to the standard. From this point the expedition comprised 12 men, 10 sledges, and 80 dogs.

The now continual daylight enabled me to make at this camp a modification in my march formation that brought my advance and main parties closer together, and reduced the likelihood of their being separated by open leads. Bartlett went to the front here again with his division, taking Henson and his division with him. Marvin and I with our divisions remained in camp twelve hours longer, and then followed. When we reached Bartlett's camp he turned out and went on and we turned in. By this arrangement the advance party was travelling while the main party was asleep, and *vice versâ*, and I was in touch with my advance party every twenty-four hours.

At the end of the second march in this section, Marvin obtained a satisfactory latitude sight, which placed us at 85° 48′. This result agreed very satisfactorily with the dead reckoning of Marvin, Bartlett, and myself, and the positions of our camps up to this point were adjusted from this observation. Up to this time the slight altitude of the sun had rendered it not worth while to waste time or strain the eyes in observations.

At the end of the third march beyond here, Marvin obtained another satisfactory sight for latitude, which gave our position as 86° 38′. This gave us a definitely measured record of 50′ of latitude made good in three marches. From this point Marvin turned back in command of the third supporting party. My last words to him were, "Be careful of the

Autumn sledging parties to Cape Columbia Camp on Parry Peninsula. Cape Joseph Henry is shown in the background to the left, across James Ross Bay.

Ferrying across a lead.

leads, my boy." Again, the best Eskimos, the best dogs, the best sledges were retained for the main party: sledges were repaired, and the party went on from here, comprising 9 men, 7 sledges, and 60 dogs.

With a more compact party and every one increasing in fitness and training with each day, we were now in shape to do some record travelling, and should have made a great record in the next five marches, with Bartlett in the lead, but for two hostile occurrences: one, the cutting of a march in two, and a day's delay by the opening of an impassable lead; and, second, the occurrence of a strong northerly wind during two days, which crushed the ice southward and stole from us a number of our hard-earned miles. This five-march section presented a greater variety of going than any previous one. In the first march was encountered a zone of the deepest snow of the entire journey. In the next, we encountered an active lead, and the cake of ice bearing Bartlett's igloo was adrift for a while. Beyond this, we crossed a lake of young ice, buckling under our sledges, some six miles in width. These conditions were followed by large heavy old floes, covered with hard snow and increasing in diameter as we proceeded.

The fifth march brought us close to the 88th parallel, unless the north wind had lost us several miles. The wind blew all night and all the following day. At this camp, in the morning, Bartlett started to walk five or six miles to the north, to make sure of reaching the 88th parallel. While he was gone I selected the forty best dogs in the outfit and had them double rationed, picked out five of the best sledges, assigned one to Bartlett's party, and broke up the seventh for material with which to repair the others, and set the Eskimos at the work.

Bartlett returned in time to take a satisfactory observation for latitude in clear weather, and obtained for our position 87° 48′. This showed that the continued north wind had robbed us of a number of miles of hard-earned distance. Bartlett took the observation here, as had Marvin five camps back, partly to save my eyes, but largely to give an independent record and determination of our advance. The observations completed and two copies made, one for him and the other for me, Bartlett started on the back trail in command of my fourth supporting party, with two Eskimos, one sledge, and eighteen dogs. When he left I felt for a moment pangs of regret as he disappeared in the distance, but it was only momentary. My work was still ahead, not in the rear. Bartlett had done good work, and had been a great help to me. Circumstances had thrust the brunt of the pioneering upon him instead of dividing it among several, as I had planned. He had reason to take pride in the fact that he had bettered the Italian record by a degree and a quarter, and had covered a distance equal to the entire distance of the Italian expedition from Franz Josef Land to Cagni's farthest north.

I had given Bartlett this position and post of honour in command of my fourth and last supporting party for two reasons: first, because of his magnificent handling of the *Roosevelt*, and because he had cheerfully stood between me and many trifling annoyances on the expedition: and second, because it seemed to me appropriate, in view of the magni-

ficent British record of Arctic work, covering three centuries, that it should be a British subject who could boast that, next to an American, he had been nearest the Pole. More than this, Bartlett was the only man now with me competent to ensure the return of the supporting party to the ship.

With the disappearance of Bartlett I turned to the problem before me. This was what I had worked for during twenty-three years; for which I had lived the simple life; for which I had conserved all my energy on the upward trip; for which I had trained myself as for a race.

Now, in spite of my years, I felt in trim, fit for the demands of the coming days, and eager to be on the trail. As for my party, my equipment, and my supplies, they were in shape beyond my most sanguine dreams of earlier years. My party might be regarded as an ideal one, loyal, and responsive to my will as the fingers of my right hand. Four of them held the technique of dogs, sledges, ice, and cold as their heritage. Two of them, Henson and Ootah, were my companions to my farthest north three years before. Two others, Egingwah and Sigloo, were in Clark's division, which had such a narrow escape at that time. My dogs were the very best, the pick of 133, with which we left Columbia. Almost all were powerful males, hard as nails, in good flesh, but without a superfluous ounce, without a suspicion of fat anywhere, and, what was better yet, they were all in good spirits. My sledges, now that the repairs were completed, were in good condition. My supplies were ample for forty days, and, with the reserve represented by the dogs themselves, could be made to last fifty.

Pacing back and forth in the lee of the pressure ridge where our igloos were built, while my men got their loads ready for the next marches, I settled on my programme. I should strain every nerve to make five marches of twenty-five miles each, crowding these marches in such a way as to bring us to the end of the fifth, long enough before noon to permit the immediate taking of an observation for latitude.

Weather and open water permitting, I believed I could do this. If my proposed distances were cut down by any chance, I had two means in reserve for making up the deficit: first, to make the last march a forced one, stopping to make tea and rest the dogs, but not to sleep. Second, at the end of the fifth march to make a forced march with a light sledge, a double team of dogs, and one or two of the party, leaving the rest in camp.

Underlying all these calculations was a recognition of the ever-present possibility of open leads, and impassable water, and the knowledge that a twenty-four hours' gale would knock all my plans into a cocked hat, and even put us in imminent peril.

At a little after midnight of April 1, after a few hours of sound sleep, I hit the trail, leaving the others to break camp and follow. As I climbed the pressure ridge back of our igloos, I set up another hole in my belt, the third since I started. Every man and dog of us was as lean and flat-bellied as a board and as hard.

Up to this time I had intentionally kept in the extreme rear, in

order to straighten out any complication that might occur, to encourage any one that might be feeling blue from the heavy going or a broken sledge, and to see that everything was drawing properly. Now I was in my proper place, in the lead; and it was with a thrill of quickened blood and senses that I pressed on at the head of my little caravan.

It was a fine morning. The wind of the last two days had subsided, and the going was the best and most equable of any we had yet. The floes were large and old, hard and clear, and were surrounded by pressure ridges, some of which were almost stupendous. The biggest of them, however, were easily negotiated, either through some gap or up some huge hard drift. I set a good pace for about ten hours, which gave us 25 miles and took us well beyond the 88th parallel. While we were building our igloos, a long lead formed to the east and south-east of us, at a distance of a few miles.

A few hours' sleep, and we were on the trail again. The weather was fine, and the going like that of the previous day, except at the beginning, when pickaxes were required. This and a brief stop at another lead cut down our distance. But we made some 20 miles in ten hours, which put us half-way to the 89th parallel. During this march the ice was grinding audibly in every direction about us, but no motion was visible. Evidently it was settling back into equilibrium, and probably sagging northward with its release from the wind pressure.

Again a few hours of sleep, and we hit the trail before midnight. The weather and going were even better than before. The surface, except when interrupted by infrequent ridges, was as level as the glacial fringe from Cape Hecla to Cape Columbia, and harder. We marched something over ten hours, the dogs being often on the trot, and made 25 miles. Near the end of the march we rushed across a lead 100 yards wide, which buckled under our sledges, and finally broke as the last sledge left it.

We stopped in sight of the 89th parallel, in a temperature of 40° below zero. Again a scant sleep, and we were on our way once more, and across the 89th parallel. This march duplicated the previous one as to weather and going. The last few hours it was on young ice. Occasionally the dogs were galloping, and we made 25 miles or more. The air, the sky, and the bitter wind burning the face till it cracked, reminded me in this march of the great interior ice cap of Greenland. Even the natives complained of the bitter air. It was as keen as frozen steel. A little longer sleep than the previous ones had to be taken here, as we were all in need of it.

On the following march the weather was thick, but it gave me no serious uneasiness, as before turning in I had taken a precautionary observation which indicated our position as 89° 25′. A dense, lifeless pall hung overhead. The horizon was black and the ice beneath was a ghastly, chalky white, with no relief—a striking contrast to the glimmering, sunlit fields over which we had been travelling for the previous four days. The going was even better than previously, and there was scarcely any snow on the hard, granular, last summer's surface of the old floes, dotted with the sapphire ice of the previous summer's lakes.

A rise in temperature to 15° below zero reduced the friction of the sledges, and gave the dogs the appearance of having caught the spirits of the party. When we had covered, as I estimated, a good fifteen miles, we halted, made tea, ate lunch, and rested the dogs. Then we went on another estimated fifteen miles. In twelve hours' actual travelling time we made thirty miles. There was no sign of a lead in this march.

I had now made my five marches, and was in time for a hasty observation (at approximately local noon Columbia meridian) through a temporary break in the clouds, which indicated our position as 89° 57′. I quote an entry from my journal some hours later :

"The Pole at last! The prize of three centuries, my dream and goal for twenty years, mine at last! I cannot bring myself to realise it.

"It all seems so simple and commonplace. As Bartlett said when turning back, when speaking of his being in these exclusive regions, which no mortal had ever penetrated before :

"'It is just like every day!'"

When our igloos were completed we had our dinner, the dogs were double rationed, and I wrote up my notes and went to sleep while Henson and the Eskimos unloaded the sledges and got them in readiness for repairs, which I had instructed them to make during our stay here, so as to reduce the probability of delays from breakage on the return trip. Later they came in, and I turned out, to be in readiness for an observation at 6 P.M., Columbia meridian time. The sky was still overcast, but there were indications that it would clear before long, and, after a little, I got out with my two men, and, with a light sledge, carrying only my instruments, drawn by a double team of dogs, I went on an estimated distance of ten miles. It cleared while we were travelling, and I was able to get a satisfactory series of observations at Columbia meridian midnight, which observations indicated our position as being beyond the Pole.

I then returned to camp in time for another set of observations at 6 A.M. of the 7th, Columbia time, which later were followed by a final satisfactory series of observations at Columbia noon of the 7th.

In all, I had taken thirteen single, or six and a half double, altitudes, at two different stations, in three different directions, at four different times, under satisfactory conditions, except for the first single altitude on the 6th. The temperature during these observations had been from −11° Fahr. to −30° Fahr., with clear sky and calm weather (except for the single observation on the 6th).

In traversing the ice in various directions as I had done, I had allowed approximately ten miles for possible errors in my observations, and at some time during my marches and counter-marches I had probably passed over or very near to the Pole.

The observations were taken with a John Bliss 8-inch sextant, reading to 10″, with a mercurial horizon, with a specially devised wooden trough and a modified roof, which gave a mercurial surface practically level with the edges of the trough, and with the plane of the mercurial surface well above the bottom of the roof glasses.

Lunch on last march northwards, April 5-6. The cookers are shown in the snow shelter.

Last camp on sea ice on the return journey, in the latter half of April.

The method of taking these observations was as follows: a semi-circular wind-guard of snow-blocks was erected opening to the south. The instrument box was firmly bedded in the snow and packed down to a firm bearing, and snow was packed around the box; then a skin or a spare coat was thrown over the snow about the box, partly to prevent any possible softening of the snow, partly to protect the eyes of the observer from the intense reflected glare of light from the snow. The artificial horizon and roof was placed on top of this instrument box.

Between the instrument box and the inner end of the snow shelter a skin was thrown down, on which the observer lay flat on his stomach with his head to the south, and head and sextant close to the artificial horizon. He rested both elbows on the snow, holding the sextant firmly in both hands, and moving head and instrument, until the sun's limb was obtained in the narrow, fore-shortened surfaces of the mercury.

With fur clothing, my personal experience has been that the element of cold in handling the sextant is not so serious as imagined, and with the blanket inner mittens used with our fur hand-gear covering the hands, there is little trouble from the insensible moisture of the hands condensing on the instrument.

The principal difficulties which I have experienced have been the condensation upon the instrument of the insensible perspiration of the face (even with the respiration restrained), and the weariness of the eyes from the incessant blinding daylight in which the observer has been travelling.

Snow-goggles, while helping, do not entirely relieve the eyes from strain, and during a series of observations they become extremely tired, and sometimes uncertain.

As the result of these observations my flag was displayed, and photographs taken of it and of the party. No recent ice was observed in these trips, or in the vicinity of the camp, where a sounding could be made. Careful examination of the horizon in every direction with a telescope showed no indication of land or land clouds. The temperature at the time of our arrival, when the sky was overcast, was 12° Fahr. below zero, as indicated by one of Green's minimum self-registering thermometers. When it cleared the temperature fell, and, at the time of our departure, the thermometer registered 33° Fahr. below zero.

From about eight o'clock in the evening (Columbia meridian time) until the time of our departure, the weather was clear and brilliant, with at times a light breeze, just sufficient to straighten out my silk flag.

After displaying the flags and taking photographs, we turned in to get a few hours of sleep, before starting on the return. After a short time in the igloos, however, as no one seemed to be sleepy (every one being apparently keyed up by the excitement of the occasion), and it seemed too bad to waste such fine marching weather by remaining in camp, I gave the word to hitch up, and to go back to our next camp for a sleep.

Leaving the camp about four o'clock of the afternoon of the 7th, we started on our return, having again double-fed the dogs, repaired the

sledges for the last time, and discarded all our spare clothing to lighten the loads.

Five miles from the Pole, a narrow crack filled with recent ice, through which we were able to work a hole with a pickaxe, enabled me to make a sounding. All my wire, 1500 fathoms, was sent down, but there was no bottom. In pulling up the wire it parted a few fathoms from the surface, and lead and wire went to the bottom. With the loss of the lead and wire, the reel became useless, and was thrown away, lightening Oo-que-ah's sledge by 18 pounds. The first camp was reached in good time, and the march would have been a pleasant one for me, but for my eyes burning from the strain of the continued observations of the previous hours.

After a few hours' sleep we hurried on again, Eskimos and dogs on the *qui vive*.

I was anxious, if possible, to cover two outward marches on each of our return marches, which I believed we could do, barring accidents, since we had a trail to follow, and would need to waste no time in making camp, as the igloos built on the outward journey could be re-occupied. At this camp I inaugurated the system followed throughout the return march, of feeding the dogs according to the distance covered, that is, double rationing them when we covered two marches. I was able to do this, on account of the reserve supply of food which I had in my dogs themselves, in the event of our being seriously delayed by open leads.

At the next camp we made tea and ate our lunch in the igloos, rested the dogs, and then pushed on again. The weather was fine, though there were apparently indications of a coming change. It took all of our will power to reach the next igloos, but we did it, and were asleep almost before we had finished our supper.

The next day was a wild one. When we awoke a strong north-north-east true wind was blowing with steadily increasing violence. Again, as on the previous day, we made the next camp, had lunch and hot tea in the igloos, rested the dogs, and then pushed on. The wind had now become a gale; the snow was whirling past us in blinding clouds, we and the dogs and sledges scudding before it, with the ice raftering under and all about us with the pressure of the gale.

It would have been impossible to have travelled against this gale, and perhaps without it we would not have reached Bartlett's igloos, as the force of the wind helped us along. When we arrived at Bartlett's igloos, men and dogs were nearly exhausted. At this camp the continuance of the gale gave us good reason for a fair sleep and rest. In the next march we covered only one outward march. We might, perhaps, have covered another, but I found that, in the forced rush of the previous three marches, I had strained both dogs and men nearly to the elastic limit, and I did not dare to risk it. From here on, however, with a few exceptions, we covered two of our outward marches in each return.

Though Bartlett, Marvin, and, as I found out later, Borup, had been delayed by open leads, we probably, as the result of the northerly gale,

were never delayed more than a couple of hours at a single lead. Sometimes the ice was fast and firm enough to carry us across; sometimes a short *détour*, sometimes a brief halt for the lead to close, sometimes an improvised ferry on an ice-cake enabled us to cross and keep the trail without difficulty, down to the tenth outward march.

There the trail disappeared completely, and the entire region was unrecognisable. Where on the outward journey had been narrow cracks, there were now broad leads, one of them over five miles in width, caught over with young ice. Here again fortune favoured us, and no pronounced movement of the ice having taken place since Bartlett passed, we had his trail to follow. We picked up the old trail again north of the seventh igloos, followed it beyond the fifth, and at the big lead lost it finally. From here we followed Bartlett's trail, and on April 23 our sledges passed up the vertical edge of the glacial fringe, a little west of Cape Columbia. When the last sledge came up I thought my Eskimos had gone crazy. They yelled and sang and danced themselves exhausted. As Ootah sat down on his sledge he remarked in Eskimo: "The devil is asleep or having trouble with his wife, or we never should have come back so easily."

A few hours later we arrived at Crane City under the bluffs of Cape Columbia, and after putting four pounds of pemmican into each of the faithful dogs to keep them quiet, we had at last a chance to sleep our fill.

Two days we spent here in sleeping and drying our clothes. Then for the ship. Our dogs, like ourselves, had not been hungry when we arrived, but simply lifeless with fatigue. They were different animals now, and the better ones among them stepped out with tightly curled tails and uplifted heads, their iron legs treading the snow with piston-like regularity.

We reached Cape Hecla in one march of forty-five miles, and the *Roosevelt* in another of equal length. When we got to the *Roosevelt* I was staggered by the news of the fatal mishap to Marvin, who had been drowned at the "big lead" while hastening back at the head of his supporting party. He had been either less cautious or less fortunate than the rest of us, and his death emphasised the risk to which we had all been subjected, for there was not one of us but had been in the leads at some time during the journey.

The "big lead," cheated of its prey three years before, had at last gained its human victim.

Many factors had entered into the success of the expedition, but standing pre-eminently at the head was *experience*. Through a period of nearly twenty years, a thorough knowledge of all the details of Arctic work, equipment, methods, clothing, rations, capabilities of Eskimos and dogs, the contingencies of ice travel, had been gained.

In the previous expedition for the first time a true knowledge of actual conditions existing in the central polar basin had been secured, and with this combination it was possible to provide for practically every contingency. Added to this was the fortunate factor of a not unusual depth of snow on the icefields to impede us, and the non-occurrence of

strong easterly or westerly winds while we were on the ice. The occurrence of such winds, resulting as they would in pronounced lateral motion of the ice, would have given us serious trouble. Such wind as we did have was from the north, and had the effect of keeping the ice crowded against the land and preventing lateral motion.

After my return to the ship, MacMillan and Borup made a trip to Cape Morris K. Jesup, where tidal observations were taken and soundings made north from that point as far as 84° 17′. Returning from this trip, MacMillan went to Fort Conger for a series of tidal observations there, to connect our work at Sheridan, Bryant, Columbia, and Jesup with the observations of the Lady Franklin Bay expedition.

On July 18 the *Roosevelt* left her winter quarters, and was deliberately driven out into the centre of the channel pack off Cape Union. From here she fought her way south in the middle of the channel, and passed Cape Sabine on August 8, thirty-nine days earlier than in 1908, and thirty-two days earlier than the British expedition in 1876.

On August 26 I landed the last of my faithful Eskimos at Cape York. On September 5 the expedition arrived at the wireless station at Indian Harbour on the Labrador coast, from whence, on the 6th, the message "Stars and Stripes nailed to North Pole" was sent vibrating southward through the crisp Labrador air.

The culmination of long experience—a thorough knowledge of the conditions of the problem (gained from the last expedition), together with a new type of sledge, which reduced the work of both dogs and driver, and a new type of camp cooker which added to the comfort and increased the hours of sleep of the members of the party—combined to make the last expedition an agreeable improvement upon the previous ones in respect to the rapidity and effectiveness of its work, and the lessened discomfort and strain upon the members of the party.

But the dearly bought years of experience, the magnificent strength of the *Roosevelt*, the splendid energy and enthusiasm of my party, the loyal faithfulness of my Eskimos would have gone for nought but for the sinews of war furnished so loyally by the members and friends of the Peary Arctic Club. And it is no detraction from the living to say that to no single individual among these has the final result been more signally due than to my friend the late Morris K. Jesup, founder and first president of the club.

APPENDIX.

Notes on Soundings.

The sounding equipment of the expedition consisted of two reels of specially made piano wire (0·028 in. diameter, and weight 12·42 lbs. per 1000 fathoms), of 1000 fathoms each and three 20-lb. leads, cut down to 14 lbs., with clam-shell device for grasping samples of the bottom. These reels were arranged to be fitted quickly to the upstanders or nose of a sledge when making a sounding, and had handles for reeling in the wire and lead.

One of these reels and leads were carried by Bartlett with his advance party, and the other reel and two leads by the main party. Portions of the wire and the two

leads were lost at various times in hauling up, owing, probably, to kinks in the wire. When a sounding at 85° 23′ was made 700 fathoms only were left of the sounding wire of the main party, and Bartlett, with the other 1000 fathoms, was in advance and inaccessible. In hauling up the wire from this sounding it parted again, and some 200 fathoms, together with two pickaxe heads and a steel sledge shoe, which had been used to carry it down, were lost. When Marvin turned back, Bartlett's 1000 fathoms and the remaining 500 fathoms of the other reel were combined. When Bartlett made a sounding at 87° 15′ I gave him explicit instructions to use the utmost caution in regard to the wire, in order not to lose any more of it, as I wanted it all for a sounding at the Pole, should I succeed in getting there. Acting upon these instructions, Bartlett ran out 1260 fathoms and then stopped on account of a small kink in the wire, which he feared would part when the wire was hauled up. When I made my sounding about 5 miles from the Pole the wire parted, as had been feared, and the last lead and nearly all of the wire were lost.

We obtained a sounding of 310 fathoms at 85° 23′ which naturally impressed me at once as surprising, and when Marvin reported the result to me, immediately after taking the sounding, I asked him if he was sure that he had the bottom, and he replied that he was, as the fact of this pronounced shoaling from 825 fathoms in 84° 29′ to 310 in 85° 23′ impressed him at once, and he made sure that his depth was correct. Again, when a sounding of 700 fathoms and no bottom was made about 10 miles farther north, we both spoke of the peculiar fact of this outlying ridge with deeper channel intervening between it and the continental shelf, and Marvin again said that he was sure of his 310 fathoms reading. Had it not been for the loss of the last lead and practically all of the wire while making the soundings at the Pole, I should, on the return, have interpolated other soundings.

The results indicate that a line of 5-mile interval soundings from Cape Columbia to the 86th parallel might develop a particularly interesting profile of the bottom of the Arctic Ocean.

General Notes on Temperature.

The lowest temperature observed on the recent expedition was 59° below zero, March 14, 82 miles north of Cape Columbia. The lowest temperature observed at Cape Sheridan was 54° below zero.

The mean monthly temperatures during September, October, November, and December 1908, were lower than those taken three years previously, the mean temperature for December being nearly 8° lower. The mean temperature for the eleven months during which the expedition was at Cape Sheridan was nearly the same as on the previous expedition.

The frequency and violence of the winds was much less than three years previous, and there was constantly less open water throughout the year.

Summary of Tidal Observations by Coast and Geodetic Survey

Station.	Lunitidal interval.	Mean range.	Period observed.
	h. m.	feet.	days.
Pt. Aldrich, C. Columbia,	7 58	0·84	28
Cape Sheridan,	10 31	1·77	220
Cape Bryant,	12 20	0·98	29
Cape Morris Jesup,	10 49	0·38	10

The maximum or tropic range of the diurnal wave is 0·57 foot at Pt. Aldrich, 0·50 foot at Cape Sheridan, and 0·93 foot at Cape Bryant.

Summary of Meteorological Observations by Coast and Geodetic Survey.

The mean temperatures read at midnight (60th meridian) and noon are as follows :—

1908.	Midnight.	Noon.	1909.	Midnight.	Noon.
	°	°		°	°
August 17-28, .	25·3	27·2	May 3-31, . .	15·7	20·1
September 1-30, .	9·4	10·9	June 1-30, . .	25·9	30·5
(3 days missing)			July 1-12, . .	31·9	33·5
October 1-31, . .	- 2·8	- 3·1			
(3 days missing)					
November 1-30, .	- 19·9	- 21·4			
(11 days missing)					
December 1-14, .	- 25·4	- 25·1			

Expert Finding Upon Records.

Department of Commerce and Labour, Coast and Geodetic Survey,
Washington, March 16, 1910.

Mr. O. H. Tittmann,

Superintendent Coast and Geodetic Survey Office.

Sir,—I have the honour to report that the tidal records obtained by Commander R. E. Peary during his latest Arctic expedition consist of practically unbroken series of hourly readings of the height of the tide, taken day and night, at the following places and between the dates specified :—

Station.	Period of observation.	Length of record.
		Days.
Cape Sheridan, .	November 12, 1908, to June 30, 1909 (total loss of record, 31 hours), ...	231
Cape Columbia, .	November 16, 1908, to December 14, 1908, .	29
Cape Bryant, . .	January 16, 1909, to February 13, 1909, . .	28
Fort Conger, . .	June 10, 1909, to June 25, 1909 (total loss of record, 5 hours), ...	10

The observations were taken day and night, and besides the regular hourly readings, numerous additional readings were generally taken near the times of the high and the low waters.

From the records themselves, and from plottings constructed from them, it appears that the observations were taken with great care and thoroughness.

The principal results from these records have been already obtained, and are on file in this office.

In order to show the full geographical value of the results, it will be necessary to consider them in connection with all other tidal results relating to the Arctic Ocean. This work is now under way.

Commander Peary's observations leave little to be desired in regard to tidal observations between Cape Morris Jesup and Cape Columbia ; but there are long

stretches of the Arctic coast where nothing is available. This is especially true of the Russian coast and the western and northern portions of the Arctic archipelago. However, we have recently received some tidal information from the Russian hydrographic office, with the promise of more, which will pertain to regions where no knowledge of the tides has heretofore been available.

The results obtained from Commander Peary's records show that the tides along the northern coasts of Grant Land and Greenland are quite different in many respects from what had been heretofore supposed. For example, his records prove that the tide occurs three hours earlier at Cape Columbia than at Cape Sheridan, and not later, as has been generally assumed.

As already intimated, the full significance of these observations in respect to Arctic geography cannot be seen at this time.

The meteorological records submitted to this office consist of thermograms covering about 180 days, and barograms covering about 260 days.

Respectfully yours,

R. A. HARRIS.

NOTE.—Mr. Harris, whose report is above presented, is the tidal expert of the Coast and Geodetic Survey, to whom the records of Commander Peary had been referred for scrutiny and examination.

METEOROLOGY IN THE WEDDELL QUADRANT DURING 1909.[1]

By R. C. MOSSMAN, F.R.S.E.

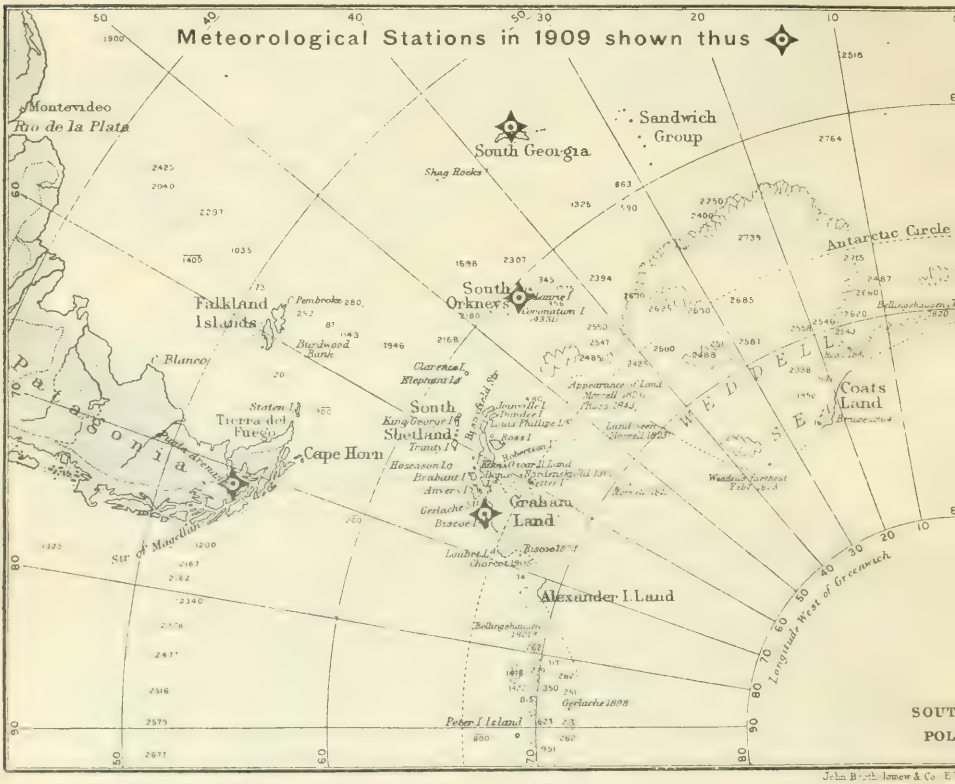
(*With Sketch-Map and Diagram.*)

OWING to the presence in Antarctic waters last year of Dr. Charcot's Expedition and to the relatively close proximity of his winter quarters to other sub-antarctic observing stations, an exceptionally fine opportunity is presented for instituting a direct comparison between the climatic features of certain stations situated in a portion of the Weddell Quadrant embracing some 12° of latitude and 27° of longitude. The interest of the inquiry is enhanced by the circumstance that Dr. Charcot's observations in 1909 were taken within a few miles of the position occupied by him in 1904, so that the two series virtually refer to one and the same locality, and can thus be directly compared with each other. The preparation of this paper has been greatly facilitated by the remarkable promptitude with which the meteorologist of Dr. Charcot's Expedition, Lieutenant Rouch, has worked up the observations, an abstract of which, printed on the arrival of the *Pourquoi Pas?* in Punta Arenas, was in my hands early in March. I am indebted to Dr. Charcot for permission to utilise his results, and to Mr. Walter G. Davis, Director of the Argentine Meteorological Office, for

[1] In sending this paper Mr. Mossman has also forwarded tables giving abstracts of hourly meteorological observations made at Laurie Island, South Georgia, Punta Arenas, and Petermann Island, during 1909. We regret that considerations of space make it impossible to print these tables here, but the general deductions which may be drawn from them are indicated below.—ED. *S.G.M.*

the privilege of making use of the South Orkney and South Georgia data, as well as to the Rev. S. Marabini of the Meteorological Observatory at Punta Arenas, for a very complete synopsis of observations taken by him during the past year. The position of these four stations is shown in the accompanying map.

The relief of the South Orkney party under Mr. Alexander Lindsay, who received his meteorological training at the Ben Nevis Observatory, was again effected early in February by the Argentine gunboat



Uruguay, which had a most favourable passage both on the outward and return journey. Except for some large bergs between South Georgia and the South Orkneys no ice was encountered, the pack having cleared away from Laurie Island on the 5th of November.

During the past year the hourly meteorological and magnetical observations have been made in the same complete form as in past years, the reductions and tabulations having been effected as part of the daily routine on the island, so that on the arrival of the expedition in Buenos Ayres the observations were available for immediate discussion. Observations have also been made thrice daily at the headquarters of the Argentine Whale Fishery Company at Cumberland Bay, South

Georgia, and as already indicated, Dr. Charcot's results at Petermann Island, on the west coast of Graham's Land in 65° S. latitude, have been supplied to me. The monthly and annual means at Punta Arenas are also available.

Table I. (p. 412) affords a comparison of the seasonal values for the South Orkneys, Punta Arenas, and the west coast of Graham's Land for the years 1904 and 1909.

The mass of material above indicated enables us to follow the year's weather in the localities named, and in dealing with it in the present instance I propose to avoid giving detailed expression to a comparison of the climatic features of the individual months, and to treat the data in a generalised form with special reference to their bearing on problems of Antarctic meteorology, in continuation of a paper[1] communicated to the Royal Society of Edinburgh two years ago.

It was then pointed out that the peninsula of Graham's Land divided two wind systems. On the west side of the peninsula the wind circulation was found to be dominated by an all but permanent low-pressure area in that southern extension of the South Pacific known as the Bellingshausen Sea, the centre of the low-pressure area being on the mean of the year located in about 64° S. and 90° W. On the east side of Graham's Land a similar low-pressure area was found in the Weddell Sea, the centre varying with the season of the year, being furthest south in autumn, and furthest north in winter, but normally central in latitude 66° S., longitudes 30° to 35° W. With this distribution of pressure the winds on the west side of Graham's Land in from 62° to 66° S. were almost wholly from the north, north-east and east, while in higher latitudes to the south-west, as shown by the *Belgica* data, a monsoonal effect was apparent, the winds being easterly in summer and westerly in winter. On the Weddell Sea side of Graham's Land, as shown by Nordenskjöld's Snow Hill data,[2] the prevailing winds in 64° S. were south-west, while at the South Orkneys the dominant direction was a little south of west. The areas traversed by these winds before arriving at the stations under discussion are thus markedly different. The prevailing north-east winds on the west side of Graham's Land, blowing as they do from lower and warmer latitudes, carry with them to the south of the Antarctic circle the high temperatures of the regions of their origin. On the east side of Graham's Land the prevailing south-west winds being of continental origin, bring about an abnormally low temperature for the latitude, the effect being greatest at Nordenskjöld's Snow Hill station, and diminishing over the region embraced by the South Orkney group to the east, where the prevailing winds are but little to the south of west.

The observations for the year 1909 afford a striking example of this remarkable contrast. In every month except March and April the mean temperature at Charcot's winter quarters, situated some 250 miles to the south of the South Orkneys, was higher than

[1] "The Meteorology of the Weddell Quadrant and Adjacent Areas." *Trans. Roy. Soc. Edin.*, vol. xlvii. part I. No. 5.

[2] *Meteorologische Ergebnisse der Schwedischen Südpolar Expedition.* Bearbeitet von Gösta Bodman. Vol. I. Stockholm, 1908.

at Laurie Island, the excess being most pronounced in May, June, and July, amounting on the mean of these three months to 8° F. and reaching a maximum of 9°·7 in July. The contrasts are even more marked in the case of the minimum temperatures, the lowest recorded at the South Orkneys in May being 16° lower than at Petermann Island, in June 24° lower, and in July 21°. The absolute minimum for the year showed 64° of frost at Laurie Island, but only 43 of frost at Petermann Island. At Petermann Island a much lower mean barometric pressure prevailed than at the South Orkneys, being on the average of the eleven months, January to November, over a tenth of an inch lower and reaching nearly a quarter of an inch of mercury in July and August. The same applies to the lowest pressure observed, which was 27·806 inches at Petermann but 28·151 inches at Laurie Island, or a third of an inch lower on the west coast of Graham's Land. The winds were almost wholly from the north and north-east at Petermann Island, while at the Orkneys south-south-west and west were the prevailing directions, north and north-east accounting for but 8 per cent. These pronounced contrasts between the two places find expression in all the meteorological elements, and Lieut. Rouch's elaborate analysis of the climatic elements in relation to the direction of the wind throws further light on the meteorology of this region. From the table given by him covering the 317 days spent at Petermann Island, it would appear that the lowest barometric pressure occurred with east winds, and the highest with north-west winds, indicating that the deepest depressions as well as the anti-cyclones were located as a rule to the north of the station. The warmest as well as the stormiest wind is the north-east, and the coldest and also the calmest is the south-east. The most humid wind is the north-west, which is essentially an oceanic wind, while the east wind is the driest, having been deprived of much of its moisture by the continental area of Graham's Land. It would appear that during the greater part of last year the cyclonic system normally found in 90° W. was located some 20° of longitude to the east of its usual position, and was also deeper than usual, as shown by the constancy of the low pressure at Petermann Island, where, as we shall see later, the pressure was much lower than in the same region in 1904.

Dealing now with the three stations, Laurie Island, South Georgia, and Punta Arenas, with which it is possible to compare 1909 with average conditions, we find that mean barometric pressure was in close agreement with the normal on the mean of the year. In April and August pressure was considerably under the average at the two southern stations, where the most prominent excess was in March and October. At Punta Arenas, on the other hand, the lowest mean pressure relative to the normal was in July and August, and the most marked excess in the spring months, September to November. Mean temperature was a little in excess of the average on the mean of the year at South Georgia and the South Orkneys, but at Punta Arenas the year was distinctly cold, in marked contrast to what was experienced at Petermann Island some 700 miles due south. The summer and early autumn were somewhat mild at the South Orkneys. The pack, as mentioned in my former

paper,[1] cleared away at the end of August 1908, and was not seen again until February 28th, 1909, when large quantities of heavy drift ice entered Uruguay Bay on the north side of the island. This pack ice was of the most formidable description, being some 20 feet in thickness, and must originally have formed part of a very heavy floe of several years' growth which had come from some distant part of the Weddell Sea, this sea being probably cleared of ice only at long intervals. During March and April there was much ice in the vicinity of the islands, and this drifted out and in of the bays with every change of wind, but it was not until May 24th that Scotia Bay froze. May was a cold month at the South Orkneys where mean temperature was 3° below the normal, but at South Georgia temperature was 1° in excess of the average. At both stations August was a mild month, the excess being 4° at the South Orkneys but only 1°·5 at South Georgia. In December for the third time in the last five years pressure was about the same at the two places, so that a pronounced tendency is indicated for the isobars in this region to trend north and south with the lowest pressure to the eastward.

Comparison of the Years 1904 and 1909.

In Table I. will be found a comparison of the two years 1904 and 1909 for the west coast of Graham's Land, as represented by Dr. Charcot's observations at Wandel Island and Petermann Island, and also for the South Orkneys and Punta Arenas. The data discussed comprise mean barometric pressure, mean temperature, and percentage frequency of wind. The results are grouped by seasons, autumn comprising the three months March, April and May, winter June, July and August, and spring September, October and November, while values for the ten months February to November are also given. Summer could not be included, as in 1909 Dr. Charcot left his winter quarters by the end of November. It will be noted in the wind table that no calms are given for the South Orkneys and Punta Arenas. This does not mean that the air is never calm at these stations. At the South Orkneys, owing to the surrounding hills making the winds squally and uncertain, it is necessary to utilise the observed drift of the lower clouds for getting a true record of the winds, while at Punta Arenas the data referring to calms are not given, but it is probable that they form but a very small percentage of the whole owing to the stormy nature of this region.

A comparison of the meteorological characteristics of the seasons for these two years shows some interesting features. It will be seen that barometric pressure was much lower in 1909 than in 1904 at all places, except at Punta Arenas in the spring months, and that the difference was most marked on the west coast of Graham's Land. Mean temperature was much higher in 1909 than in 1904 at the South Orkneys and Graham's Land, but at Punta Arenas the reverse was the case. The excess of warmth was specially marked at Petermann Island, where the winter of 1909 was as much as 10°·8 warmer than that of 1904. The

[1] Cf. this *Magazine*, vol. xv. p. 405.

TABLE I.—Comparison of the Meteorology of the South Orkneys, West Coast of Graham's Land, and Punta Arenas, for 1904 and 1909 by Seasons.

Station.	South Latitude.	Mean Barometric Pressure at 32° Sea Level and Standard Gravity.								Mean Temperature.							
		Autumn		Winter		Spring		Ten Months Feb. to Nov.		Autumn		Winter		Spring		Ten Months Feb. to Nov.	
		1904.	1909.	1904.	1909.	1904.	1909.	1904.	1909.	1904.	1909.	1904.	1909.	1904.	1909.	1904.	1909.
		Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	°	°	°	°	°	°	°	°
Graham's Land,	65	29·336	29·129	29·408	29·122	29·395	29·218	29·357	29·159	21·9	25·4	9·9	20·7	25·3	26·3	20·2	25·2
South Orkneys, .	61	29·314	29·208	29·442	29·332	29·492	29·315	29·394	29·282	22·7	24·1	12·2	14·6	23·3	24·7	20·7	22·3
Punta Arenas. .	53	29·614	29·535	29·605	29·487	29·479	29·723	29·572	29·583	44·0	41·5	35·4	33·6	44·9	42·4	42·4	40·2

Percentage Frequency of Wind.

Direction.	Graham's Land.								South Orkneys.								Punta Arenas.							
	Autumn		Winter		Spring		Ten Mths.		Autumn		Winter		Spring		Ten Mths.		Autumn		Winter		Spring		Ten Mths.	
	1904.	1909.	1904.	1909.	1904.	1909.	1904.	1909.	1904.	1909.	1904.	1909.	1904.	1909.	1904.	1909.	1904.	1909.	1904.	1909.	1904.	1909.	1904.	1909.
N.	11	14	7	20	5	23	6	18	3	6	5	6	5	3	4	6	11	15	15	18	15	13	13	16
NE.	19	24	22	27	33	23	24	25	4	2	0	0	0	0	2	1	16	15	13	16	16	6	15	12
E.	0	4	1	3	10	1	4	3	3	3	1	1	3	0	2	2	7	4	5	2	4	2	6	2
SE.	1	4	5	5	4	2	4	4	4	11	2	1	9	5	5	7	2	0	1	0	2	0	1	0
S.	36	9	47	13	24	11	33	9	13	12	12	24	4	16	9	17	4	0	2	1	4	6	3	2
SW.	11	7	6	8	11	7	10	7	33	27	19	26	18	23	27	24	18	7	26	6	16	22	19	11
W.	0	4	0	2	1	4	1	3	25	24	39	31	39	42	35	30	22	19	28	25	32	30	27	25
NW.	1	2	3	3	1	3	3	3	15	15	12	11	22	11	16	13	20	40	10	32	11	20	16	32
Calm.	21	32	9	19	8	26	15	28	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...

contrast between the Julys of these years was most remarkable, July 1904 having a mean temperature of —2°·6 F., while that of 1909 was 19°·8, a difference of 22°·4. In the July of 1904 winds were almost wholly from the south, and barometric pressure was as much as four-tenths of an inch higher than in 1909, whereas last year the low pressure was associated with a constant succession of gales from the north and north-east. At the South Orkneys, while the difference between the two years was sufficiently pronounced, conditions were, comparatively speaking, normal, so that the "centre of action" situated in the Bellingshausen Sea must be much more active and subject to greater variation than that in the Weddell Sea. It is in the winter that these variations are most prominent. Thus in the winter of 1904 the thermal gradient between Punta Arenas and Wandel Island was equal to 2°·2 F. for each degree of latitude, while in 1909 temperature fell off at only half this rate between the two places. The variations in the barometric gradient are also equally great. The gradient between the two "centres of action," the South Pacific anti-cyclone and the Bellingshausen Sea low-pressure area, is best expressed by taking the pressure at the island of Juan Fernandez (lat. 33° 37′ S., long. 78° 50′ W.) on the one hand, and that of Charcot's winter stations on the other. For last year, however, the data from Juan Fernandez are not yet available, so we have taken for 1904 the mean pressure as shown by the two stations of Ancud and Point Galera on the Chilian littoral, the former being in lat. 41° 51′ S., long. 73° 50′ W., and the latter in 40° 01′ S., 73° 44′ W. For 1909 the same stations are not yet available, but I have taken the daily values for Valdivia and Puerto Montt from the Chilian Daily Weather Maps and computed monthly means, which can be compared with confidence with the 1904 data because these places are in close proximity to the other two stations. The values of barometric pressure for the two winters (months of June, July and August) of 1904 and 1909 are as follows, Punta Arenas and the South Orkneys being given for comparison :—

Mean Barometric Pressure at 32° Sea Level and Gravity.

Station.	Latitude.	1904.	1909.	Difference.
		Inches.	Inches.	Inches.
Chilian Littoral, ...	41° S.	29·845	30·109	+0·264
Punta Arenas, ...	53°	29·605	29·487	−0·118
South Orkneys, ...	61°	29·442	29·332	−0·110
Graham's Land, ...	65°	29·408	29·122	−0·286

Hence in 1904 there was only a difference of 0·437 inch between the pressure at 41° S. and in 65° S., while in 1909 the difference was 0·986 inch, more than twice as great. In July 1904 the difference between the two stations was only 0·253 inch, but in 1909 nearly four times larger, or 0·997 inch. The effect of a relatively high pressure area in the far south is to deflect into lower latitudes the storm centres which

normally pass to the south of Cape Horn. With these conditions a low-pressure area is found off the Chilian littoral in lat. 40° to 42° S., which produces deluges of rain on the coast of Chili between the latitudes of 37° and 45° S., the rains in a modified degree embracing the neighbouring parts of the Argentine Republic, and even extending over to the Atlantic coast; but in the year 1909 the South Pacific high-pressure area being far south and pressure in Artarctic regions unusually low, the storm centres passed well to the south of Cape Horn, and severe drought prevailed over Chili and the Argentine Republic.

The great difference between the winter rainfall of these two years is shown by the following table, which gives the rainfall at a few stations on the Chilian littoral and in the Argentine Republic:—

RAINFALL.—JUNE, JULY AND AUGUST.

	Lat.	Long. W.	1904.	1909.
			Inches.	Inches.
Chili—				
Conception,	37	73	54·06	14·84
Valdivia,	40	73	65·95	38·76
Punta Arenas,	53	70	4·49	2·20
Argentina—				
Chos Malal,	37	70	9·49	0·94
16th of October,	43	71	14·05	5·90
Bahia Blanca,	39	62	3·84	0·47
Rivadavia,	45	67	9·50	0·39
Cape Blanco,	47	66	7·13	0·55
Gallegos,	52	69	5·29	2·79

The differences in the rainfall on the Chilian coast between two such years as those quoted above are naturally greater at places between the latitudes of 33° and 38° S., which are normally outside the zone of excessive precipitation located in 40° S., and this also applies to that part of Argentine which lies on the eastern slopes of the Andes.

The contrasts between the winters of 1903 and 1904 were as marked as between 1904 and 1909. In 1903 the South Pacific high pressure area was well south of its normal position, and in 1904, as we have seen, far to the north. Some of the effects of this difference upon the climate, and more particularly upon the rainfall and temperature of South America, I have already discussed,[1] and all the varied information collected points to the great influence which these "two centres of action," viz. the South Pacific anti-cyclone and the Pacific low-pressure area have on the meteorology of South America. This effect is naturally most pronounced in the winter season. Taking the difference between the mean pressure of the winters of 1903 and 1904 for 150 stations over the globe, it was found that no other pair of "action centres" showed such a pronounced

[1] See "The Monsoons of the Chilian Littoral," *Trans. Roy. Soc. Edin.*, vol. xlvii., Part 1, No. 6.

variation between the two seasons as the two under consideration. Taking Nordenskjöld's Snow Hill data for 1903, and Charcot's Wandel Island data for 1904, a difference of 0·252 inch was found between the mean pressure of the winter months, that of 1904 being the higher, while at Juan Fernandez there was a fall of exactly the same amount.

It has been found that the winter rainfall on the Chilian littoral, and the amount of water in the Rio Negro, which embraces the principal river system in the south of the Argentine Republic, are a direct index of the weather and ice conditions in that part of the Weddell Quadrant south, south-east and south-west of Cape Horn. When the ice is far north the track of the cyclonic storms is far north, and when the ice is far south then the cyclonic track is also far south. This being established, it is quite easy to form some idea of the ice conditions in the Weddell Sea region for a number of years from the Chilian rain records, which reflect these southern conditions. It would appear that the exceptionally severe ice conditions which terminated in the extraordinarily unfavourable summer of 1902-1903 embraced the five years beginning with 1898. In all these years the winter rains on the Chilian coast were much heavier than usual; in 1899 and 1902 remarkably so. In this relation it may be noted that the disastrous effects of these cold years was referred to by Dr. Pirie (cf. this *Magazine*, vol. xxi. p. 11). Referring to the unhatched eggs and dead nestlings found by the *Scotia* Expedition at Laurie Island in the nests of the Wilson Petrel, he remarks, "a more feasible explanation would be that there had been a succession of cold summers, which certainly was the case in 1902-1903 whatever it may have been before that."

In this connection the following diagram showing the total winter

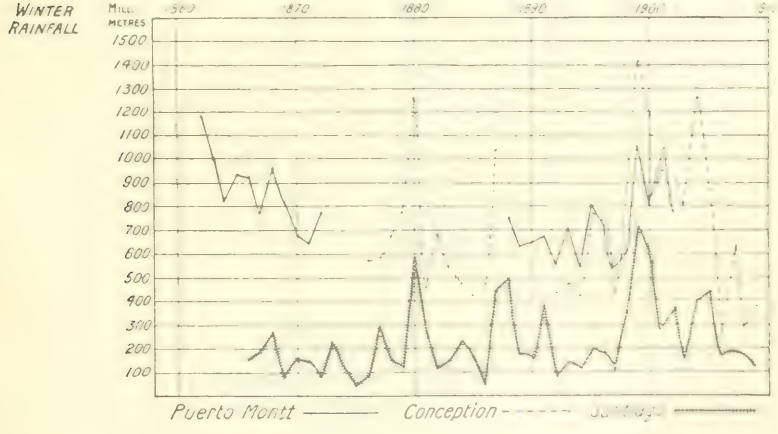


Diagram showing the total winter rainfall at Puerto Montt, Conception, and Santiago, 1860-1910.

rainfall at three stations in Chili may be of interest. The records refer to Puerto Montt, lat. 43° S., long. 74° W.; Conception, lat.

37°, long. 73° W.; and Santiago, lat. 33½°, long. 70½° W. About 1862, 1880, 1888, 1895, 1900, and 1904 the curves show distinct crests in the amount of winter rainfall, whereas minima are indicated in 1871, 1886, 1894, 1897, 1903, and especially in 1908, which, as we have seen, was an exceptionally ice-free year in the Weddell Sea region. The very exceptional character of the five years beginning with 1898 is well shown, and it is thus very improbable that expeditions wintering in the Weddell Sea area in the near future will experience anything like the close ice-conditions found by the Swedish and Scottish explorers in the summer of 1902-1903, which marked the culminating point in a series of bad years. Although far removed from the South Pacific "centre of action," the barometric records at Santiago reflect very clearly the low pressure that prevailed off the Chilian littoral and to the west in lat. 33° to 45° S. during the winter of 1899. The mean barometric pressure was the lowest recorded for this season during the past fifty years, and this low pressure prevailed in each winter from 1898 to 1902. The records show no other instance in which the mean pressure was below the normal for more than two consecutive winter seasons, but on the other hand pressure was in excess of the normal in each winter from 1869 to 1875, and again from 1892 to 1895, thus coinciding with deficient rainfall on the Chilian littoral and open ice-conditions in the far south. It would thus appear that favourable ice-conditions are much more likely to be met with in the Weddell Sea area than unfavourable, and it would appear that the early explorers Ross, Powell, Bellingshausen, and D'Urville were unfortunate in the years they visited these regions.

The general results of the combined series of observations made by the various expeditions to the Weddell Quadrant afford material which enables us to form some idea of the unseen continent to the south. It would appear that Graham's Land is continental, and that we must accept the land reported by Morell in 70° S., 40° W. as well as the land indicated by Ross's "Appearance of Land" in about 66° S., 47° W., which Morell also reports. It is probable that this land proceeds due south on a meridian; if so, then Morell's longitude for his southern land is given 7° too far to the east. The mass of South Orkney data gives every support to the proximity of continental land, as there is no other way of accounting for the very low temperatures which occur from time to time. The assumption of the above debated land also explains the general congestion of the ice off the east coast of Graham's Land and in the western parts of Weddell Sea, as well as the close ice-conditions so frequent in summer in the low latitude of the South Orkneys. The pack, being driven by the easterly winds in high latitudes against this wedge of land south of 66° South, creeps slowly northward, and, meeting the ice driven out of what may be termed the Larsen Sea by the prevailing south-west winds, causes a congestion of the ice there, as shown by the fact that Powell, Ross, D'Urville, Larsen, and the *Scotia* in 1903 found impenetrable pack to the north of this hypothetical land. This ice a little to the south west of the South Orkneys is further augmented by the pack from low latitudes in Louis Philippe Land, and this causes a bulging of the pack to the north on the parallels of the South

Orkneys. Scotia Bay cannot break up until there is practically a clear sea to the west, and in close seasons as in 1902-1903, 1904-1905,[1] and 1907-1908 this does not occur until late in January, or even February or March, as in the summer of 1902-1903. Some light is thrown on the rate at which the ice drifts east in this region by Captain Larsen's voyage to the South Sandwich Group in November 1908. It may be remembered that this was a phenomenally open year in the Weddell Sea region, the pack clearing away from the South Orkneys at the end of August. Captain Larsen met with much pack in the middle of November when in lat. 59° S., long. 26° W., or eleven weeks after Scotia Bay broke up. If this was the same ice that then cleared away from the South Orkney Group, the eastward drift is at the rate of about seven miles a day. The more favourable ice-conditions found in close seasons to the east of the South Sandwich Group by Bruce, Ross, and Bellingshausen is probably due to the frequency of east and north-east winds in this locality, as is suggested by the summer observations of Moore and the *Valdivia*, and it is a well-known maxim among ice-masters that "wind against current opens the ice," causing it to slacken and spread. From a comparison of the observations made on the *Scotia* in high latitudes in 1903 with those taken by Nordenskjöld in 64° S., I am inclined to assign an extension of the Weddell Sea south of Weddell's furthest to the latitudes of 77° or even 78°. This throwing back of the coastline of Antarctica is also indicated by the strong undercurrent met with by the *Scotia* in 68° 23′ S., long. 12° 49′ W., as well as by the fact that the open winter of 1908, due to the small amount of ice in the Weddell Sea, was also very mild at Shackleton's winter quarters on the other side of the Pole,[2] which would appear to indicate an inter-connection between the meteorological conditions in these two widely separated regions. The trend of Coats Land at the *Scotia's* most southerly position in 74° S. 22° W. was towards the south-west, and would thus indicate a coast-line in harmony with that given in recent charts. But Coats Land may turn sharply towards the south following a meridian for some distance, joining the land south of Weddell's furthest in 77° S.

THE PANAMA CANAL.[3]

By Vaughan Cornish, D.Sc., F.R.G.S.

(With Map.)

The Panama Canal is situated in what was, until 1904, a province of the South American republic of Colombia. By the revolution which took place in that year the Province became a Republic, of which, in the language of diplomacy, the independence is guaranteed by the United

[1] In this *Magazine* for August 1909, p. 409, the date at which Scotia Bay broke up in the summer of 1904-1905 was given as January 2, 1905, instead of February 6, 1905.

[2] *The Heart of the Antarctic*, vol. ii. p. 388.

[3] A lecture delivered to the Society in Edinburgh on March 3, 1910.

States. From the Republic thus established under their ægis the government of the United States has leased a strip of land ten miles wide called the Canal Line, in the centre of which lies the Canal; and in this zone the whole administration is conducted by the United States. The canal is to be fortified by the same power, which thus has complete military and political control of the waterway. By treaty with Great Britain the canal is to be open on equal terms to the ships of commerce and of war both during peace and during hostilities. Thus, commercially, the canal is international. From a military standpoint there is, however, only a partial neutrality, since the complete military control is in the hands of one power, and there is no international guarantee such as that relating to the Suez Canal.

The American Government purchased the unfinished works of the French Company in 1904, and completion of the undertaking is promised by January 1, 1915. At first failure threatened owing to panic, caused by an outbreak of yellow fever, but the knowledge gained since the days of the de Lesseps Company, enabled Colonel Gorgas, M.D., and the Department of Health to stamp out the disease, and only one case has occurred in the last four years. The city of Panama itself was the chief centre of the disease, and the *Stegomyia* mosquito has been practically exterminated there by a thorough fumigation of every house, by doing away with all receptacles of stagnant water, and by substituting supply by pipes, and by brick-paving of the streets.

Immunity from yellow fever was the advantage enjoyed by West Indians in the old days. Now that the disease is stamped out they are on a par, hygienically, with navvies from Spain or Italy, for the West Indian is not immune from malaria and is more liable than Europeans to pneumonia. At present there are about 5000 European navvies at work, mostly Spaniards, and the death-rate among them is about the same (some twelve per thousand per annum), as among the 28,000 West Indians. The skilled work is done by white Americans, who number about 5500. Coloured American citizens are not employed on the work. The Spaniards are paid nearly twice as much as the West Indians, a circumstance which presumably indicates their relative efficiency. The superiority of the European labourer is largely due to his habit of labouring week by week with only Sunday rest, whereas the West Indian likes to vary his life by longer intervals of leisure. This habit is inconvenient in an undertaking where time is an important consideration, and where the neighbourhood does not supply any reserve of suitable labour. The necessity of obtaining all the labour from abroad is one of the circumstances which made the Panama Canal so much more arduous an undertaking than that of Suez, where there was an abundant supply of labour literally at command.

The plan of the canal was hotly debated between the advocates of sea-level and high-level. The latter prevailed, chiefly owing to the argument that the sea-level canal would take much longer to make. The high-level canal, as now being carried out, will provide a magnificent waterway: and, if ships do not grow to inordinate dimensions, may be as good, some people think even better, than a sea-level canal. The superiority will consist in having twenty-four miles of broad waterway over a lake,

and in greater freedom from currents. From the military point of view the high-level plan is inferior for the following reasons:—First, if lift-locks be damaged the time of disablement is likely to be greater than would occur in the case of attempted damage to a sea-level canal. Secondly, in the sea-level there would have been only one specially vulnerable point, viz. the dam at Gamboa, which is in the centre of the isthmus, and far from the sea. In the high-level canal the vulnerable points are two, at Gatun and at Miraflores, both within long gun-range of the sea, and thirty-four miles apart from each other.

On account of the hilly nature of the isthmus, of the heavy rainfall, and of the considerable rivers, of which the Chagres is the most important, any canal entails one or more great dams to control the rivers. We need not discuss the *pros* and *cons* of the Gamboa dam, which would have been needed for the sea-level canal. The Gatun dam is the controlling feature of the high-level plan, and on it depends the whole success of the undertaking. Much anxiety was felt on account of the supposed nature of the strata upon which it is founded, as these were reported by the earlier official surveys. I therefore give in detail the reassuring evidence which has been more recently obtained.

Two points have been raised: (1) as to the merits or demerits of an earthen dam, (2) as to the likelihood of the water finding or making a way for itself beneath the dam. Anxiety on the latter account was largely due to the announcement of the engineers, that down the valley which was to be dammed ran two old river gorges about 250 feet deep, filled only with sand, gravel, stones, shells, and the like incoherent material. Recent evidence has shown, however, that the gorges are, in fact, filled with a substance much better suited to resist the flow of water. On account of the great importance of this discovery I quote at length from the evidence furnished at Washington by Colonel Goethals, Chairman of the Isthmian Canal Commission. He said: "In boring at the site of the dam we went down approximately 260 or 270 feet in the centre of the gorges before striking rock.

"The layer of shells and the layer of gravel and boulders that had been reported as existing were found to be shells, gravel, and stones of various sizes firmly embedded in clay. When the borings were first made, consisting of wash borings, the water under pressure had washed away the clay between the gravel, so that the material brought to the upper surface appeared as loose gravel. Our drive samples and also our test pits showed this material to be surrounded by clay, compact and hard, and absolutely impervious to water.

"We have made such examination of the foundations as to leave no question or doubt as to the material and position in which the varying materials lie in these various strata, and we find that the foundations are impervious, with the exception of the top layer, consisting of sand and clay, varying in the thickness from zero to eighty feet. That is the only pervious portion of the dam foundations."

The profile of the canal is shown in the accompanying section recently published by the Isthmian Canal Commission. The length from deep water on the Atlantic to deep water on the Pacific side is about fifty

miles, and from shore to shore about forty. The least bottom depth on the Atlantic side at mean tide level will be 41 feet. As the tidal oscillation here is only 1½ feet, the least depth at any time will be 40¼ feet. On the Pacific side the depth at mean tide will be 45 feet, but the extreme range at springs is 23 feet, so that at the lowest water of spring tides there will be a depth of only 33½ feet. The depth of the high-level part of the canal will be 45 feet. Thus on the whole there will never be a day when there will not be at some time a depth of 41 feet at all points in and approaching the canal. The locks will have a usable length of 1000 feet and a width of 110 feet, being thus amply long enough to accommodate the *Mauretania*, and broad enough to take the largest battleships of the *Dreadnought* type. The time of passage is estimated at only ten to twelve hours from ocean to ocean, on account of the fact that vessels will be able to maintain a good speed in the broad waters of Lake Gatun, which extends for about twenty-four miles inland from the great Gatun Dam, which will block up the lower valley of the Chagres River. This Lake Gatun will be quite a considerable addition to the lakes of the world, its area being 164 square miles, which is twice the size of Lake Maggiore.

The economy of time claimed as a merit of the high-level canal scheme is based on the circumstance that while excavation is carried on from mile 30 to mile 39 in the Culebra Cut, the building of the locks and dams proceeds; and the time required is about the same for both. A glance at the profile shows how much greater and more prolonged would be the task of excavation from the level of *plus* 40 feet to *minus* 41 feet all the way from mile 7 to mile 42.

Soon the great interest of the scene on the Isthmus will be the stupendous structure of the locks and dams and the slowly spreading waters of Lake Gatun. At present the chief spectacle is still the deepening gorge at Culebra the form and dimensions of which are shown on the accompanying diagram. Already the excavation has been carried to a point 420 feet below the highest point of the cutting on Golden Hill, and men and machinery look small and insignificant as one gazes down into the great trench. There is a distance of between 70 and 80 feet more to be dug, and the total height from canal bottom to the highest point of the cutting on Golden Hill will be 494 feet. The water will then be allowed to flow in to a depth of 45 feet, so that the greatest height of scarped canal bank above the surface of the canal will be 449 feet. The official estimate of the cost of the canal to the American Government is about £75,000,000, but the figure has a tendency to increase.

I have visited the canal works twice, in 1907 and 1908, and am shortly going out again to examine the progress of the last two years. Even in this summary I should not like to confine myself solely to a statement of the engineering features, but desire to add a tribute to the remarkable success of the organisation and administration of life and work on the Canal zone. In 1908 I found it a marvel of good management, of law, order, and sudden civilisation.

The purpose of an inter-oceanic canal is solely to shorten sea distance, and the following is a statement of the principal reductions which will be

effected by the Panama Canal. The importance of these reductions must be considered by persons concerned in such matters according to the nature of their interests. Thus there is the primary interest of the reduction of distance for the ships of the U.S. Navy when transferred from the Atlantic to the Pacific coast of that country. Since battleships cannot be transported by trans-continental railways as troops can, this is a fundamental function of the canal.

The effects of reduction of distance on the carrying trade will be better understood when we know the dues to be charged, as to which we are still somewhat in the dark. This is the aspect of the canal called "Commercial" by the Commissioners. They distinguish from this its "Industrial" aspect, by which they mean its effect in promoting production in certain districts. It is reckoned, *e.g.*, that as the distance-reduction will be greater for the Gulf ports than for Atlantic ports, the canal will tend to the industrial development of the basin of the Mississippi, and may lead indirectly to improvements in the Mississippi waterway.

The principal reductions of sea distance are as follows:—From New York to all American-Pacific ports north of Panama it will effect a uniform reduction of 8415 miles, and to such ports south of Panama an *average* reduction of about 5000 miles. The corresponding reductions from Liverpool are 6046 and about 2600 miles. The reductions from Antwerp are about the same as from Liverpool. Between New York and Yokohama, by way of San Francisco, the reduction is 3729 miles. The distance between Liverpool and Yokohama remains unchanged, as does the distance from European to all Asiatic ports, except those in the north of Siberia. Thus Yokohama is actually brought nearer to New York than to Liverpool by 1805 miles. Shanghai is brought 1629 miles nearer to New York, but remains 295 nearer to Liverpool. The ports of southern China and Indo-China are nearer by way of Suez than by way of Panama from New York, and Manila is only 16 miles nearer by way of Panama. If, indeed, the all-American route be followed, via Honolulu and Guam, the distance via Panama is 128 miles greater. Sydney, however, will be brought 3806 miles nearer to New York, the distance between them being thus 2382 miles less than between Sydney and Liverpool. Wellington, N.Z., will be brought 2542 miles nearer to New York, the distance between them being thus 2759 miles less than between Wellington and Liverpool. The reductions of distance from New Orleans are somewhat greater than from New York.

One must not forget to notice the very important commercial position of Jamaica with regard to the canal. The position of Kingston will be radically changed in relation to world traffic. At the present time that very fine harbour is at the entrance to a cul-de-sac, for such is the Caribbean, but when the canal is opened it will be in a position of centrality for commerce and shipping, and one may trust that with the opening of the canal the prosperity of Jamaica may be enhanced. There can be no doubt that Kingston now becomes a position of greatly increased importance as one of the links in a chain of fortified harbours which ought to encircle the globe.

THE SUB-ANTARCTIC ISLANDS OF NEW ZEALAND.[1]

THE problem of the former land connections in the southern hemisphere, especially between Antarctica and other land masses, is one that has had considerable light thrown upon it by the explorations of the last ten years, in particular by the expeditions of the *Scotia*, *Discovery*, and *Antarctic*, and there is every reason to suppose that the results of the *Nimrod* and the *Pourquoi Pas?* will add further knowledge to this subject. But much valuable evidence can be gathered from a detailed examination of sub-antarctic islands, about the majority of which we know far too little, considering their relative ease of access. The report is now published on the New Zealand expedition of November 1907 to the Auckland and Campbell Islands, in the Government steamer *Hinemoa*, which took two parties of scientists, one to the Aucklands, the other to the Campbell Islands, each for about a week or ten days. It seems a pity that a longer stay could not have been arranged, or that the other outlying islands could not have been visited. Yet the expedition, short as was its duration, did excellent work. While its chief object was magnetic survey, perhaps its most important geographical results are to be gathered from the bearing of the biology of these islands on old land connections.

Mr. Cheeseman contributes a valuable paper on the flora of the islands, and its distribution as a whole. The result of his analysis is that the flora of New Zealand is much more distinct from that of any other country, than that of the southern islands is from New Zealand. Of the flora of the southern islands 27·3 per cent. of the species are endemic, in New Zealand 72·1 per cent. are endemic. Furthermore, lengthened isolation of these islands is proved by the fact that in many cases endemic species are confined to a single island or group of islands: the Snares have 2; the Aucklands, 6; Campbell Island, 4; the Antipodes, 4; and Macquarie Island, 3. In the 194 known species of flowering plants in the southern islands three groups may be distinguished: (*a*) a New Zealand element of 133 species: (*b*) an endemic element of 53 species: and (*c*) a Fuegian-South Georgian-Kerguelen element of 8 species, unknown in New Zealand. The New Zealand species are probably of comparatively recent introduction, and reached the islands since they were separated from New Zealand. The endemic element shows in some cases New Zealand affinities, in others none at all. The first part was no doubt derived from New Zealand in the long past; the second part represents the relics of some former widespread flora. The Fuegian element, if we accept Schimper's theory, is a relatively recent importation due to sea-birds. This is certainly a possible explanation, and it must be noted that eleven species found in the sub-antarctic islands of New Zealand occur either in the Tristan da Cunha group or in the St. Paul and Amsterdam Islands. Yet out of the eighty-eight genera represented in the New

[1] *The Sub-antarctic Islands of New Zealand. Reports on the Geo-Physics, Geology, Zoology, and Botany of the Islands.* Edited by Chas. Chilton, M.A., D.Sc. Christchurch, N.Z., Philosophical Institute, 1909. Price £2, 2s. net. 2 vols., illustrated, with map. (See also vol. xxiv. p. 337.—ED. *S. G. M.*)

Zealand sub-antarctic islands no less than fifty-six have representatives in Fuegia: a fact such as this we can scarcely account for by dispersal through the agency of birds, marine currents or winds, or in fact by any means but land connections. Zoological evidence also supports the theory of the former northward extension of Antarctica, and likewise geological and bathymetrical evidence. The most recent soundings in Antarctic seas, notably those of the *Antarctic* and *Scotia*, have lessened the supposed depths and shown how connections between Antarctica and other land masses could be made by relatively small and local elevations of the sea bottom along the course of the rises which occur. More exploration of the sea to the south of the New Zealand plateau on which all these New Zealand islands except Macquarie Island stand, is urgently needed, as well as a thorough exploration of Macquarie Island itself. Unfortunately this expedition was unable to visit it: it promises to prove the most interesting of all the islands. The failure of the *Nimrod* to find Dougherty Island and the Nimrod group can probably be taken to mean that they do not exist: that must be regarded as unfortunate, since such isolated spots would be bound to yield on exploration valuable geographical evidence.

Several chapters of the report are devoted to the geology of the islands, including a summary of what is known of various islands the expedition did not visit. Most of the islands show indications of former greater extension and of continental connections in their plutonic rocks. The Antipodes appear, however, to be volcanic, but our knowledge of them is slight. Bounty Island is of granite, the Aucklands of granites, gabbros, and trachytes, the Snares of granite and basalt, Campbell Island of gabbro, volcanic rocks, and some sandstones, probably of Miocene age, and Macquarie Island (according to the *Discovery*) volcanic. With the exception of Macquarie Island they all lie on the 1000-fathom plateau. That New Zealand extended at one time to the limit of this plateau looks most probable, but the gap between there and Victoria Land is more difficult to bridge; yet principally for geological reasons—largely the result of the *Discovery's* examination of the rocks of the Victoria Land plateau—we can scarcely doubt that there was former land connection. So that the state of affairs which the biologist demands for an adequate explanation of questions of distribution in sub-antarctic regions is borne out by the facts, and each year sees increasing weight given to the theory of a probable land connection of Antarctica with the southern continents, perhaps in early Tertiary times—Dr. Chilton thinks later, possibly even in Eocene times.

In both the Auckland and Campbell Islands there is abundant evidence of glaciation in the past and of greater elevation than now obtains. The same is true for Macquarie Island. Prof. Marshall says that "by ice erosion the surface of Campbell Island acquired the majority of the features which it now possesses." This former elevation may account for the glaciation, and it would also account for the preponderating New Zealand element in the biological relationships of the islands. However, it is doubtful if so simple an explanation of the Pleistocene glaciation will agree with facts. Prof. Marshall will only give a greater elevation

of less than 200 feet to Campbell Island: this would not favour the elevation hypothesis regarding glaciation. Mr. Speight, who writes the report on the Auckland Islands, is very chary of giving his adherence to any theory on this matter.

The bearing of the former extensive glaciation on the flora of the islands is interesting. Most of the pre-existing vegetation must have been exterminated during that period: in Macquarie Island, which in virtue of its higher latitude would be more heavily glaciated, probably all the phanerogamic flora was killed. Arboreal vegetation would certainly not survive, and Mr. Cheeseman points out how, with one exception, all the shrubby vegetation now on the islands consists of New Zealand forms that have doubtless reached their present location since the period of greatest glaciation. The one exception is *Olearia Lyallii*, but this is very closely allied to the New Zealand *O. Colensoi*. That part of the endemic element without New Zealand affinities must be looked on as the sole survivor of the pre-glacial vegetation. The present vegetation of Macquarie Island, as far as it is known, Mr. Cheeseman looks on as a collection of "waifs and strays" that have arrived by trans-oceanic migration, winds, and sea-birds, from Kerguelen and the Aucklands and Campbell Islands. Macquarie Island may, indeed, have been a stepping-stone in the migration of certain Fuegian-Kerguelen species to the other sub-antarctic islands of New Zealand, for it contains at least two such species not found in the other islands.

A chapter of geographical value is that on the ecological botany of the islands by Dr. L. Cockayne, than whom none could write with greater authority on the subject. Mr. R. M. Laing deals separately with the plant formations of Campbell Island.

From the report on the mammals we notice that the right whale (*Balaena australis*) is again becoming plentiful around Campbell Island, and there is word of whale-fishing beginning once more in these seas. Regarding the distribution of the sea elephant the inclusion of "Antarctic Seas" must be accepted guardedly. The sea elephant can only be looked on as a straggler among ice: it is essentially a sub-antarctic seal. The report on the birds is disappointing. Apparently by some misarrangement the study of the birds fell to no particular member of the expedition, and it was "one of the rules of the expedition that neither birds nor their eggs were to be taken." Surely this is carrying the protection of wild life to a somewhat absurd extreme!

The statement (vol. ii., p. 453) that a single grass is the only phanerogam yet observed in the Antarctic continent is incorrect. The expedition of the *Français* found also specimens of *Colobanthus crassifolius* on Anvers Island in 64° 50′ S.

Dr. Chilton adds a useful summary of results to the detailed reports, and there is a fairly complete bibliography of works dealing with or touching on the sub-antarctic islands of New Zealand.

The volumes are well illustrated with photographs and plates and a large map. The maps King Oscar Land and Danco Land have been transposed on the map. The very copious index, printed complete in both volumes, deserves praise.

R. N. Rudmose Brown.

THE GILBERT AND ELLICE ISLANDS.

THERE has been published as a Parliamentary Report (Cd. 4992), an account of a visit paid by Mr. Arthur Mahaffy, Assistant to the High Commissioner for the Western Pacific, to the Gilbert and Ellice Islands during the year 1909. The report makes interesting if pathetic reading, and is the more interesting in that the islands are somewhat inaccessible, and have hitherto been visited only at somewhat long intervals.

The Gilbert Islands lie upon the equator in long. 171°-177° E., and consist of a series of atolls, producing cocoanuts and screw-pines (Pandanus), while the sea around the islands abounds in fish. The broadest atoll is not more than half a mile across, and no portion of the area is more than twenty feet above high-tide mark. The islands are, of course, of coral formation, and as safe harbours are few, landing can generally only be effected by wading over long coral flats, of one-half to three-quarters of a mile in extent, in the broiling equatorial sun. Owing to the equatorial current, which runs with irregular but at times extraordinary strength, intercourse between the islands is limited, and the risk of loss of life in sea journeys in the native canoes is so great, that the Government has now forbidden all sea journeys save in the trading steamers.

Those who still retain a childish love of "coral islands" will be pained to learn from this Report that the Gilbert Islanders, now that, owing to the British occupation, they may no longer war with one another, nor yet risk their lives on the treacherous seas, are rapidly dying out, apparently of a combination of ennui and the diseases of civilisation. One last resource remains to them: they may not fight, but litigation, that pale imitation of war, remains, and chronic disputes over fragments of land and the ownership of cocoanut trees afford the only relief from the dreary monotony of their life.

In the old days the natives were particularly quarrelsome: the state of war was almost permanent, murders were frequent, and the battles were followed by the destruction of the enemy's food crops by the victors, so that the vanquished were reduced to a condition bordering upon starvation.

Now, as the Assistant Commissioner records with pardonable pride, the conditions are completely changed:—

"The islands are kept in the most perfect order, trees are continually being planted, land reclaimed, and the wants of the natives are ministered to by every means which the physical peculiarities of these extraordinary islands render possible. Extreme poverty is almost unknown; every man is secure in the possession of his pieces of land, and is protected from the aggression of, or spoliation by, his more powerful neighbours from which he suffered so much in the past. The taxes which are levied on the population, and which form a burden in no case too heavy to be easily borne, are used for the improvement of the islands, for a reserve in case of drought or other disaster, a small portion only of the taxes of each island going to the general revenue of the Protectorate.

Nevertheless, while in the old days the ravages of war and rapine were repaired by natural reproduction, now, when peace reigns, there are islands in which practically no children are born, for "reasons," says the author, "which the natives cannot or will not explain."

The material conditions of existence have also altered greatly, as is indicated by the following quotation :—

"The greatest difference which I noted after thirteen years' absence from the Protectorate was the excellent housing accommodation on almost all the islands of the Gilbert Group. A system of extraordinary uniformity has been developed, and the best types of native houses have been finally evolved after a series of experiments which may have been somewhat exasperating to the natives, but which have undoubtedly resulted in their general good. The villages are kept in admirable order and the roads are scrupulously clean. Hospitals are established on all islands, and all natives suffering from unsightly sores, so common in these islands, are glad to take up their residence there and are perfectly cured in many cases. I am glad to say that no reluctance exists here, as in the case of Fiji, to receive medical treatment in a Government hospital"

Formerly also the diet consisted of cocoanuts, pandanus fruits and fish, now rice, meat, sugar and biscuits are obtained in exchange for copra. The old arts and crafts have gone, the clothes, boats and sails all showing Western influence. One effect of the new, unsuitable clothes is shown in the spread of phthisis, which with other imported diseases is helping to diminish the population. Whatever it is, however, which has finally disturbed the natural balance in the islands, it does not appear to be the replacement of a dying race by a new one, for the white population of the group is apparently not flourishing. On the other hand there is a remarkable influx of Chinese, who appear to prosper better. The author of the report notes one point of interest in regard to this dying race. The daily consumption of cocoanuts by the native population is about seven per head, so that when the natives are all gone, all these nuts (the population is about 25,000) will be available for the manufacture of copra. The diminution of the population also is going on most rapidly in the islands which are richest in cocoanuts, so that comparatively large tracts of fertile land should soon be available for leasing. Copra is, we believe, chiefly used in the manufacture of soap. To some, then, it may be a consolation to know that when the Gilbert Islanders have vanished from the earth, soap may be a little cheaper.

As already indicated, the land question is meantime almost the only interest in life which remains to the natives :—

"In these narrow islands with their dense population the various land holdings have been divided and subdivided in a most extraordinary way. The land registers which are now regularly kept show thousands of small holdings, each termed a 'piece' of land, which may be any size from a few yards square to a couple of acres.

"These lands, which have descended to the natives from their ancestors or been taken in war, or acquired as the result of some faction fight, or, in some cases, as the punishment of some grave crime against the community, are all delimitated with quite extraordinary accuracy,

and although of the most varied shapes and apparently inextricably involved among other holdings, are perfectly well known and can be described with the most wonderful accuracy by their owners. I fear that I may be considered as guilty of exaggeration when I state what is a well-known fact, and one which has been proved over and over again, namely, that the natives not only know the complicated limits of their lands thus perfectly, but also that, in the case where the land bears cocoanuts, they are able to identify the nuts from the trees growing on that land. I have myself seen this done on more than one occasion, the owner having picked out his own from a heap at a trader's station, and the native who had stolen them having confessed to the theft, because he knew that the owner was perfectly correct in his recognition of the stolen property."

The report gives much less detail in regard to the inhabitants of the Ellice Islands, but states that their poverty has been exaggerated. There are now no white traders on these islands, and the steamers buy the copra direct from the natives.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

A LETTER, dated July 19, 1910, has been received from Lieut.-Col. the Hon. Sir W. H. P. Carrington, from Marlborough House, stating that His Majesty the King is graciously pleased to become Patron of the Royal Scottish Geographical Society.

The Society's Rooms in the Synod Hall will be closed during the month of August.

GEOGRAPHICAL NOTES.

EUROPE.

The Glaciers of Switzerland and the Ice Age.—Dr. V. Cholnoky gives in the *Abrégé du Bulletin de la Société Hongroise de Géographie* for 1908, which has only reached us recently, a lengthy account, with many illustrations, of a series of excursions in Switzerland which he undertook in the summer of 1908, at the close of the Geographical Congress at Geneva. We cannot attempt here an abstract of the paper, but may say in general that Dr. V. Cholnoky is not convinced by the arguments advanced in Penck u. Brückner's *Die Alpen im Eiszeitalter* in regard to many of the more difficult questions of glaciology, and especially in regard to the existence of interglacial periods during the Ice Age. He believes that many points in regard to the action of ice, and the conclusions to be drawn from the facts which can be observed in Switzerland, remain obscure, and that fuller observation, and especially fuller comparison with other glaciated regions is necessary before certain

conclusions can be drawn. An interesting point in the paper is that the author visited the usual tourist resorts, so that his reasoning can be followed by all those familiar with Switzerland.

Africa.

The Climate of Egypt and the Sudan.—At a recent meeting of the Royal Meteorological Society, Capt. H. G. Lyons delivered a lecture on "Climatic Influences in Egypt and the Sudan." He said that from early days the ancient Greeks recognised the marked difference between the climate of the Mediterranean and that of Africa, and Aristotle indicated correctly the rains of Ethiopia as the cause of the annual flood of the Nile. Travellers have supplemented our knowledge from time to time, but only within the last ten years has a network of meteorological stations given precision to our views and furnished a basis for further investigations. The comparatively low relief of the country, which lies as a vast land area in low latitudes, and the effect of the north-easterly trade winds which sweep over it, produce the hot and dry conditions which are characteristic of North-Eastern Africa. These are modified somewhat in the north by the warm waters of the Mediterranean, and in the south by the rains of the monsoon in summer; but the highest temperatures and most arid conditions are reached between Wadi Halfa and Dongola, where northerly winds, clear skies, and a great range of temperature prevail throughout the year.

The important rains are those falling in Uganda, the southern plains of the Sudan, and on the tableland of Abyssinia, since they not only provide the whole supply of the Nile and its tributaries, but also largely control their regimen. Fed by the south-easterly air-currents blowing in from the Indian Ocean, these monsoon rains supply the equatorial lakes, and the tributaries of the Nile. But it is the Abyssinian tableland, with its heavy summer rainfall, which is most effective, since it furnishes the whole of the Nile flood, and enables the Nile to maintain itself through 1500 miles of desert. As the sole source of the flood, these rains directly determine by their variation the abundance or deficiency of Egypt's supply, so that this climatic problem is of immense importance. Hardly less important in these days of intensive cultivation of cotton is the study of the winter storms which occasionally break in the Sudan and Abyssinia, raising the level of the rivers and increasing the supply of the Nile appreciably at a time when the normal supply is inadequate. Not only does the climate of the region influence the water supply, but the great range of temperature rapidly disintegrates the rocks, and the wind removes the finer portion of the material. In this way the deserts are being constantly modified, and vast ranges of sand-dunes are piled up. The distribution of vegetation is markedly influenced both by the moisture and the physical character of the country.

America.

The Geography of Alaska.—A note in *Science* (xxxi. p. 479) gives a brief account of the observations made by Prof. Hitchcock during

a tour through the interior of Alaska. Prof. Hitchcock distinguishes between the Coast Region, with a climate generally resembling that of Puget Sound, and the Yukon Basin, including a great part of the interior, with a continental climate. The former lies between the coast and the Alaska range, which is a continuation of the Cascade Mountains. It extends from Ketchikan to Cook Inlet, and has a high rainfall (111 inches at Sitka), equable temperature, and much cloud and fog. In the interior, on the contrary, the winters are very cold and the summer temperature high, even over 90° in the shade. The rainfall is small (10-14 in.) and the weather is usually clear. The Yukon basin is separated from the Arctic Slope by a low range of mountains, the continuation of the Great Continental Divide. The greater part of Alaska is timbered, the south-eastern portion densely so, while the trees in the interior are sparse and scattered. The timber line has usually an altitude of between 2000 and 3000 feet, and the chief trees are white and black spruce (*Picea canadensis*, and *P. mariana*), aspen (*Populus tremuloides*), and white birch (*Betula alaskana*). At Hot Springs many plants occur which were not observed elsewhere, and the water is used for heating a large hotel and also for greenhouses. In the interior the drainage is poor, making the soil cold and moist in spite of the low rainfall. Only a thin surface layer thaws in summer, the deeper layers being permanently frozen.

The tundra region of Nome has several peculiarities which distinguish it equally from the Coastal Region, the Interior, and the Arctic Slope. Trees are absent, but the true Arctic flora is not present.

Swiss Scientific Expedition to the Andes.—This expedition, which we mentioned here on p. 98, left Switzerland towards the end of June for South America, under the leadership of Professor Fuhrmann, to explore the Andes. The present arrangement is that the expedition is to be absent two years instead of one as first planned.

The French Antilles.—A recent note in the *Revue Générale des Sciences* gives some interesting facts and statistics in regard to the French West Indian Islands, which more even than the British islands have suffered from the decay of the cane sugar industry. In the period from 1882 to 1908 the commerce of the chief islands fell to about half, while the white population, which was 19,000 in 1847, had sunk to 5000 in 1906, owing to the emigration of the more energetic individuals, who have taken with them the capital which formerly furthered the enterprises of the islands. In the same period the coloured population increased from 231,000 to 367,000. A variety of causes have conspired to produce these results. One of them affords a somewhat curious example of human inertia. Though the period when the cultivation of cane sugar yielded large profits has long gone by, yet the planters still retain a predilection for this crop. No less than half the cultivated area is still covered with the sugar-cane, nor has the competition of beet sugar led to improvements in methods or in machinery. Nevertheless, all the important tropical plants will flourish in the

islands, and it seems clear that the cultivation of sugar-cane must be largely replaced by other more profitable crops, especially such fruits as pineapples and bananas, if the islands are to have any future before them at all.

Australasia.

A New Volcano in German Samoa.—At a recent lecture of the Royal Institution, London, Dr. Tempest Anderson gave an account of a visit to Matavanu, in the island of Savaii in German Samoa.

Savaii, though not the seat of government, is the largest of the Samoan Islands, and has a backbone of volcanic mountains, some rising to a height of over 4000 feet. Most of them are extinct or dormant, but there have been several small eruptions within the last two hundred years, and one so recently as 1902. The volcano of Matavanu was formed in 1905, to the north of the main ridge and near the centre of the island. The early part of its eruption was of the explosive type, and the ejecta were mainly solid. Later, however, an enormous quantity of fluid basic lava was discharged, and this flowed by a sinuous course of about ten miles to the sea, through a valley which it has filled to a depth of as much as 300 feet or 400 feet in some places. It has devastated some of the most fertile lands in the island, covering them up with lava fields probably not less than twenty square miles in area. The crater, which is perhaps a quarter of a mile long by half as much wide, is a wonderful place. It contains a lake, or rather river, of molten lava so fluid that it rises in incandescent fountains, beating in waves on the containing walls and rushing with the velocity of a cataract down into a gulf or tunnel at one end of the crater. Still liquid, it continues its course in a passage, or perhaps system of passages, under the surface of the lava field, its direction being marked by a line of large fumaroles, until it reaches and fills the lagoon within the coral reef that fringes the shore. Its contact with the water is marked by violent explosions and the discharge of large volumes of steam, black sand, and solid masses. When the action is less energetic a structure resembling that of some varieties of pillow lava is produced.

Commercial Geography.

Railway Development in Northern Nigeria.—The Imperial Government has under consideration the question of constructing a railway to open up at once the great tin-fields of the Bauchi province of Northern Nigeria. The proposed line is to be a branch of the Baro-Kano Railway, which it would leave at a point about sixty miles from Zaria—the centre of the cotton industry. In view of the fact that a large capital—about £3,000,000—is invested in the tin-fields of this province of the Protectorate, the question is now being considered of diverting work from the Baro-Kano line and of employing the capital necessary for its construction to Kano in constructing the line to the tin-fields. The new line, which is to be 120

miles in length, has been surveyed during the past few months, and pending the construction of the railway a motor road is being built to transport heavy machinery, etc. Work on this was begun some time ago.

The latest news from Northern Nigeria shows that railway construction is making rapid progress. During the present year over 100 miles of rails have been laid in the direction of Kano. The Baro-Kano line has already reached the spot from which the proposed branch to Bauchi would be made. Zungeru, the capital of the Protectorate, is now connected to Baro by rail, and by the end of the year there will be a complete circle of railway communication from Lagos via Jebba across the Niger to Baro. It is estimated that the new branch to the Bauchi tin-fields could be completed within a year.

From the *Annual Report* for 1908-9 (No. 633) we quote the following paragraphs, which indicate the changes which the present railway development has already produced, and the further changes which are to be expected in the future :—

"The cultivation of food-stuffs has increased, new markets have been established, and the present safety of the roads has greatly increased the internal trade of the country, as large caravans are now enabled to travel freely without any fear of molestation. The petty traders have readily availed themselves of the opportunity afforded on that section of the Baro-Kano Railway on which natives are allowed to travel by construction trains.

"Great improvement in the export trade may be anticipated from the extension of the Baro-Kano Railway. To the north of Minna there is a most extensive area of shea butter trees, but very little of the produce of this area has, up to date, been placed on the market, partly on account of the cost of transport, and partly owing to the reluctance of the pagans to have intercourse with markets outside their districts. The construction of the railway has done much towards gaining the confidence of these people, and the reduction in the cost of transport consequent on the completion of the railway will render it possible to place profitably this produce on European markets.

"Further north the railway will pass through the rich agricultural and stock-raising Hausa Provinces, which at present export live stock, skins, and potash by means of annual caravans. With cheap and more expeditious transport, the articles mentioned should provide considerable freight for the railway. Throughout the Hausa States, and particularly in the neighbourhood of Kano, the soil is well cultivated and produces cotton and maize. The extent of this cultivation is limited by local requirements and the lack of regular markets; the completion of the railway will dispense with the former and provide for the latter, and in a few years' time the production could be sufficiently increased to establish a regular export trade."

The Trans-Andine Tunnel.—We gave some account here (cf. p. 39) of this tunnel, which now makes direct railway communication possible between Chile and the Argentine. An article in the *National Geographic Magazine* for May gives an interesting illustrated account of the tunnel, and also of the older method of traversing the Andes, across the Pass of Uspallata, 12,605 feet above sea level. The formal opening

of the tunnel took place on April 5, and it is expected that the regular train service from Buenos Aires to Valparaiso will occupy only 34 hours, as compared with the 3½ days which were necessary when the summit gap between the railway lines had to be traversed in the diligence or on horseback. The pass is only open between October and May, and in the winter seasons it used to be necessary to take the long and stormy sea voyage through the Straits of Magellan, which occupied about eleven days. While it is believed that the heavy exports of both the Argentine and Chile will continue as heretofore to be sent by sea, it is probable that imported manufactured goods, both from Europe and America, especially those which are valuable in proportion to their bulk, will be sent across the continent when necessary by rail through the new tunnel.

General.

Weather Cycles.—At a recent meeting of the Scottish Meteorological Society, Mr. G. G. Chisholm, Lecturer on Geography in the University of Edinburgh, delivered an address on "Weather Cycles." Reference was first of all made to the reputed cycle associated with the well-known eleven-year "sun-spot period," and it was stated that, according to Professor Supan, the definite results arrived at by investigations made up to the present time were as follows:—(1) There is no doubt that the frequency of cyclones in the East and West Indies increases with the frequency of the sun-spots; (2) in the tropics, years with few sun-spots are generally drier than years in which sun-spots are numerous, but this rule is not without exceptions, and in the temperate zone there is no demonstrable connection between the two sets of phenomena; (3) in the tropics the years of greatest sun-spot frequency are colder than those in which spots are few, but the total variation does not amount to 1° Fahr., and in this case also no appreciable influence in the temperate zones can be made out.

The greatest worker in the field of research under discussion has been Brückner, who thinks that he has succeeded in proving that in the course of the last nine years our earth has been subject to variations of climate whose period can be stated in round numbers at thirty-five years, but whose range varies in different parts of the world. Taking Brückner's data and the variations in the results deduced from the data, the lecturer stated he was disposed to ask what useful significance could be attached to the alleged cycle of thirty-five years? He did not question the general utility of Professor Brückner's great labours or the importance of some of his results, but considered that the general conclusion might more properly, and in a much less misleading manner, have been stated in something like the following terms:—An examination of the data throwing light on the climate of the world in past times shows that periods of relatively warm and relatively cool weather and periods of relatively moist and relatively dry weather alternate with one another in all parts of the world, these periods varying in length from about twenty to about fifty years, reckoned from minimum to minimum or maximum

to maximum; that the warm and cool periods begin and end about the same time in nearly all parts of the world, and that whilst there is not the same amount of correspondence in the dates of the moist and dry periods, the moist correspond in a large measure with the cool periods, and the dry with the warm periods. Mr. Chisholm also referred to Mr. A. P. Jenkin's three-year rainfall period, and to Mr. Ellsworth Huntington's theory of long-period alternations of warmth and drought and cold and humidity in Central Asia, and criticised the argument of Professor Partsch, adopted by Professors Supan and Philippson, in support of the contention that there can have been no diminution in the rainfall of the Mediterranean region since Roman times.

NEW BOOKS.

EUROPE.

Impressions of Provence. By Percy Allen. London: Francis Griffiths, 1910. *Price* 12*s.* 6*d. net.*

Those who are interested in Provence cannot do better than apply to Mr. Percy Allen's book. He seems to have caught the spirit of the land, and he carries the reader along with him in his travels through the sun-baked country and amidst the quaint, old-world cities and villages, beguiling the way with legends of old Provence and pictures of the home life of the inhabitants of to-day. Avignon and its palace, Villeneuve with its neglected remains of past glories, the blue fountain of Vaucluse, and the titanic Pont du Gard, each finds a suitable setting in the author's pages. Even bustling, modern, grubby Marseilles has its picturesque side revealed. But, as Mr. Allen says, "let no traveller who knows not Provence believe that here, more than in other lands, he will escape his measure of woe. According to the season, he will be grilled by the sun, or buffeted and frozen by the mistral; he will be parched by dust, tortured by mosquitoes, harassed by sudden floods; he will experience occasional miseries inseparable from a sojourn among a people ignorant and careless of hygiene." The old dog-Latin saying about Avignon, *Avenio, ventosa, fastidiosa; sine vento, venenosa*, remains true to-day. But the beauty and interest of the country far outweigh the drawbacks.

Mr. Allen tells of his visit to Frederic Mistral, the poet of Provence, at his home in the village of Maillane, and narrates in Mistral's words the pretty legend of The Three Harvesters who proved to be Le bon Dieu Himself, St. Peter, and St. John. The book is rich in stories, and in writing of the Camargue and its village of Les Saintes Maries de la Mer, Mr. Allen tells also the beautiful legend which narrates how the holy women brought the faith of Christ into France. We can only refer in passing to the author's visit to Aiguesmortes, the city beside the dead waters, as to which Mr. T. A. Cook writes, "The sentinels of the town are disease and desolation." But Mr. Allen manages to stay there and survive. Two long chapters are devoted to Arles and her women, amongst whom the classic types of face and figure survive, and we would mention the account of a bull-fight at Nimes, which is *not* of the bloodless kind that the French take credit for in the present day spectacles in the Roman arenas of Provence.

The illustrations by Léopold Lelée and Marjorie Nash are spirited and good, and help to make up a very attractive record of impressions.

By Loch and River. By Thomas Sinton. Inverness: The Northern Counties Newspaper and Printing and Publishing Company, Limited. 1910. *Price* 4*s.* 6*d.*

In this book the loch is Loch Laggan, and the river is the Spey, the beauties of both of which are familiar to all who have any pretensions to know Scotland. The writer, as a native of Badenoch, is honestly enthusiastic in his descriptions of the scenery and of the people. Well versed in Gaelic, he has made himself acquainted with much of the folklore, the local traditions, and the family histories of the locality; and although the descriptions are apt to become a little tedious and wearisome, the interest is fairly maintained throughout. As a graphic description of one of the fairest tracts of Scotland this book will appeal to many besides those who go to Speyside and Badenoch for their summer holidays.

Walks and People in Tuscany. By Sir Francis Vane, Bart. With 16 Illustrations. London: John Lane. 1910. *Price* 5*s. net.*

The author of this volume spent some time in Italy on his return from the Boer War, more especially in Tuscany, where he wandered on foot or on bicycle over a good many of the less frequented paths and roads. He had command of sufficient Italian to make himself understood by the peasantry, of whom he saw a good deal, and for whom he formed a great admiration. This volume, it appears, contains some former contributions to the Italian press, the contents of a small book published some time ago in Florence, and also fresh matter bearing on the scenery and people of Tuscany. It is not a guidebook in the ordinary sense of the word. Thanks to his knowledge of Italian, and his ability to lay aside the usual reserve of an Englishman, the author had a fairly good time, going over unfrequented bypaths and roads among simple, kindly, and hospitable people. Nothing exciting or unusual occurred to relieve the monotony of his holiday, and the days were so singularly uneventful that we doubt if any of the readers of this book would feel disposed to follow the author's example.

The Breezy Pentlands. By the Rev. Geo. M. Reith, M.A. Edinburgh and London: T. N. Foulis, 1910. *Price* 3*s.* 6*d.*

This is a welcome addition to the scanty literature of the Pentland Hills. The author gives the history of his book, and notes its chief characteristics thus:—"Its purpose is to create and foster interest in Edinburgh's great natural playground, by putting together, more or less discursively, notes and impressions, descriptive, historical, physiographical, anecdotical, collected in many a delightful ramble over the Pentlands during the last ten years. It is therefore to be regarded neither as a guide-book to the hills, nor as an exhaustive treatise thereon, but simply as talk about them, reduced to something like order and system by following the main routes around and across the range. . . . In their original form, most of the chapters that follow were actually letters, travel-letters written for the *Singapore Free Press*, to give Brither Scots in the Far East an occasional whiff of the auld countree."

The discursive garrulity—or its affectation—that is notable in the earlier part of the book is perhaps quite in place in articles contributed to the far-off newspaper, but is apt to be received with some impatience by the home-reader wishful to get to the hills. This, and the thick paper, and the large type make the volume rather big and heavy to carry on one's walks. The composition is in places faulty: in not a few instances what are punctuated as "sentences" lack verb and

subject, are in fact mere "phrases," and the relative is too often separated from its antecedent by a full stop. A somewhat careful reading has shown us only one material error of fact: on p. 126 a footnote makes a confusion between the Redford near Bavelaw and the Redford near Colinton; it is the latter that is to be the site of the barracks. On p. 140 it is said that Pont's map places certain names in "Clydsdail"; we think the author has here misread his map; on our copy we find them in "Tvedia, Twee-dail."

These, however, are relatively small matters against which we balance the intrinsic value and interest of the book. The author is what he calls a Pentland enthusiast, and though he thinks that Edinburgh has not as many of these as it should have, we hope and expect that the sale of his book will show that there are more of them than he thinks. It is within our own knowledge that Pentland walkers increase in numbers year by year; schoolboys and also schoolgirls are learning the delights of the open wilderness, and we have found even bare-footed city callants wandering among the hills, tired and hungry, with only the vaguest ideas of locality and direction.

We hope that the Scottish Rights of Way Society will take active note of the removal of its guide-posts in the remoter parts of the hills, and that the Ordnance Survey and Messrs. Bartholomew will adopt the suggestions made for the correction and improvement of their maps.

When Mr. Reith reaches his second edition—and may it be soon—will he please add some notes on natural history and geology? The Pentlands offer an excellent field for these studies, but the necessary information has not yet been gathered into a single volume.

The Story of Padua: Mediæval Towns Series. By Cesare Foligno. Illustrated by Giovanni Vianello. London: J. M. Dent and Sons, Ltd., 1910. *Price* 4*s.* 6*d.*

The story of the City of St. Anthony stretches back to pre-Roman days, and while the record of its citizens is less turbulent than that of some other cities of Northern Italy, it claims respect for their humanistic efforts, and in its day the University held a foremost position in Europe. The artistic treasures of the city (Giotto, Mantegna, Titian, etc.) have been unduly overshadowed by the proximity of Venice, but "few cities can present to the art-lover a better opportunity of studying art in its early evolutionary stages." It is strange that hitherto no general history of Padua existed, but now in Signor Foligno the city has found a worthy chronicler. The volume is a notable addition to a notable series.

Motoring in the Balkans, along the Highways of Dalmatia, Montenegro, the Herzegovina and Bosnia. By Frances Kinsley Hutchinson. With Map and over 100 Illustrations from photographs by the Author. London: Hodder and Stoughton, 1910. *Price* 12*s. net.*

This beautifully printed and finished volume describes a motor tour in the Balkans undertaken by the "Leader" and a "trio," of whom the writer is one. It would be interesting to know who they were, and whence they came, and what kind of motor carried them safely through their journey amid so rough a country. But we are left in the dark; no names are mentioned, and we only read of the Leader, the Cautious One, the Enthusiast, Madame Content, the Gentle Lady, and the Persistent One, some of which designations must be duplicates, but all become very tiresome. We learn that the car was a 28 h.-p. double phaeton

with a Cape-cart hood, and as petrol is always "gasoline," we may safel conjecture that we are following the travels of a party of Americans.

The style is irritating, generally in the present tense, and in spite of careful and more or less vivid descriptions it is not an easy volume to read. Here is a specimen: "Suddenly a loaded wagon drawn by two horses appears on the road before us. Poor things! How frightened they are! And the teamster—how he trembles—how his teeth chatter! This predicament is not a pleasant one for either party, as there is no parapet to the road and the distance down the precipice is many hundred feet. We instantly stop on the outside, and the chauffeur talks soothingly to the horses and rubs their noses until they consent to be led by the evidently harmless although terrifying monster. The man is grateful and smiles pleasantly as he pursues his downward course, and we hope fervently that we may not meet many vehicles on this narrow pass."

Their tour takes the travellers through lands unknown to most, and by unfamiliar towns, the route starting from Trieste and ending at Vienna by way of Abbazia, Zara, Ragusa, Sarajevo, Agram, Graz, and the Semmering. The volume will be a useful guide to intending visitors in these lands. It contains a large number of interesting photographs.

The Bernese Oberland. Vol. i. From the Gemmi to the Mönchjoch. Part ii. The Groups North and South of the Main Range. A New Edition. By W. A. B. Coolidge. London: T. Fisher Unwin, 1910. *Price* 10*s.*

Climbers and others interested in the details of mountain routes will welcome the appearance of a new edition of this member of Conway and Coolidge's Climber's Guides. Presumably the number of really earnest climbers is not, however, increasing greatly, for the price of these tiny volumes remains high, and as six parts are now devoted to the Bernese Oberland, a complete set of guides for this district costs £3, and this exclusive of maps.

In his preface Mr. Coolidge acknowledges the assistance he has received from an MS. "Guide" written by the late Mr. G. F. M. Benecke, but he has also of course made many ascents and done much exploration in the region himself, and is thus well qualified to write upon it.

The general plan of the volume is much the same as that of other members of the same series. Under each peak is given the height in metres and feet, followed by an often lengthy discussion of the different names which the peak has borne. Then comes an account of the first known ascent, a list of references to the peak in Alpine literature, and detailed but concise descriptions of the various routes up it, with the times taken. At the end of the volume there are a number of sheets of paper for the notes of the climbers using the book during their own ascents.

The books are thus quite definitely for climbers, and from our point of view we regret that even a few words have not been added as to the geological composition of the different mountains. But this is of course to look at the books from a different standpoint from that for which they were intended. Climbers will find in them at present all the details they require for guideless work, and the exceedingly neat and handy size is for this purpose a great recommendation.

ASIA.

New China: A Story of Modern Travel. By W. Y. Fullerton and C. E. Wilson. London: Morgan and Scott, Ltd. *Price* 3*s.* 6*d.*

Messrs. Fullerton and Wilson went to China as a deputation from the Baptist Missionary Society, and their book is a record of impressions in course of their

visits to the Society's mission stations in Shensi, Shansi, and Shantung. The reports are chiefly about evangelising work, which cannot well be dealt with here, but incidentally the authors give an account of their travels in parts of China which are seldom visited by Europeans, except missionaries, and in which it requires all the devotion evoked by the missionary spirit to induce English men and women to make their homes. It is interesting to learn that at Kai-feng-fu, in Shantung, there exists a colony of Chinese Jews, and that a tablet still stands which tells the story of their fortunes, and how they arrived in China during the Han dynasty (200 B.C.—226 A.D.). At Si-an-fu, in Shensi, the ancient capital, to which the Chinese court fled when the armies of the foreign powers marched to Pekin in the year 1900, can be seen the Nestorian tablet which is said to date from A.D. 781, and which records, in Chinese and Syriac inscriptions, the introduction of Christianity into China by the Nestorian Christians in A.D. 505.

Under the name of "the modern Martyr City," the authors give an account of their visit to Tai-yuan-fu, in Shansi, where, on 9th July 1900, fifty-three Europeans belonging to missions in the province, men, women and children, were cruelly massacred in the courtyard of the Governor's yamen, and by his orders. It must be remembered that an edict had gone forth from Peking to "kill the foreigners." Now the railway comes up to the south gate of the city, and a western university has been established by the Chinese government in token of the new understanding brought about after the madness of 1900. But though China is "New China" in some respects, 'tis but a leaven of newness and much of old China remains; as is proved by the authors' description of roads, "one palpitating mass of gelatinous mud," with holes in them large enough to engulf a mule and its burden, and of the gruesome places which still do duty for roadside inns.

On and Off Duty in Annam. By GABRIELLE M. VASSAL. London: William Heinemann, 1910. *Price* 10*s. net.*

The well-known Librairie Plon of Paris has published many volumes dealing with the life and conditions of French Indo-China, several of which have been from time to time noticed in this *Magazine*, but so far as we can recollect, the volume now before us is the first production on the same subject that we have seen by the hand of an English lady. In grace and vivacity of style, and in freshness and lightness of touch, it holds its own with any of its French predecessors. Naturally Madame Vassal hardly ever refers to politics or economic statistics. The attraction of her work is the simplicity and good humour with which she describes the strange people, *i.e.* the Annamese, among whom her husband has been working since 1904. She has remarkable powers of observation, which she has used to good purpose, more especially with regard to social and domestic details, which so often escape the notice of the sterner sex. The interest of the description of her surroundings at Nhatrang, the Pasteur Institute of the east coast of Annam, never flags, and is diversified by anecdotes of travelling or native life which are both amusing and instructive. The latter part of the book contains an account of a brief sojourn on the Langbian plateau in the south of Annam, in the country of the half-savage Mois. While there Madame Vassal was the guest of the Director of the Agricultural Station, situated at Dalat—a most successful experiment in improving the local agriculture, for which equal credit must be given to Dr. Tersen and to M. Doumer, then Governor-General of Indo-China. Under the auspices of the Director she was able to make expeditions and to see parts of the country where no European lady had ever penetrated before. The conditions of travelling in such a country would try the nerve of travellers much more experienced than

Madame Vassal; we do not so much refer to the dangers, bad as they were, of marching from one camp to another in the jungle, as the being confronted nightly with the choice of sleeping in the open, with the chance, or rather the probability, of being carried off by a tiger, or trying to find rest and sleep in a filthy Moï hut where the smoke-smells and mosquitoes were intolerable, and where she could not stand erect. The book is well illustrated with many beautiful photographs taken by Madame Vassal herself. Our readers who heard her bright and instructive addresses to the Society in February last will welcome this volume, in which she gives a more detailed account of her sojourn in Annam.

The Garos. By Major A. Playfair, T.A. Published under the orders of the Government of Eastern Bengal and Assam. London: David Nutt, 1909. *Price 7s. 6d. net.*

The origin of the Garos of Assam is a problem regarding which the last word has not yet been said. The general trend of evidence, however, goes to support the dictum of Sir J. Bamfylde Fuller, that they are "of the stock known as the Tibeto-Burman, which drifted into Eastern India and Burma across the plateaux of Tibet." Before they were tamed by the British they had an unenviable reputation as bold, truculent robbers, but now under the Pax Britannica this phase of their character has subsided and developed into intense litigiousness, for which they are notorious. Some time ago the Government of Assam ordered a compilation of the information then available for the many tribes and communities within its jurisdiction, and Major Playfair was entrusted with the duty of preparing a monograph on the Garos. His personal experience of the country and his acquaintance with the language and people were exceptional qualifications for the work, and the monograph now before us shows that in addition to this he has made a conscientious study of all other sources of information regarding the Garos which were open to him. The result is an exhaustive, careful, and thoughtful book which will be a mine of information for any one who has a special interest in the Garos, and certainly for all officers who have to do with the administration of the Garo Hills. Major Playfair has spared no pains in collecting together and recording what is known of this strange people. Probably it was high time that this should be done, because owing to the propaganda of Hinduism on the one side and of Christianity on the other, the Garos are rapidly diminishing in number, and apparently ere long will be absorbed into other tribes and religions. Even now it is doubtful if they number 150,000. It was wise, then, to compile a record of their history, distribution, domestic life, laws, customs, ceremonies, religion, etc. In passing we may remark that some of the laws of property among the Garos indicate that they are a long way ahead of our most advanced Socialists. We are told that "no man may possess property, unless he has acquired it by his own exertions. No man can inherit property under any circumstance whatever." The interest of this valuable monograph is ethnological, social, and economical, rather than directly geographical, but nevertheless we cordially recommend it to the perusal of our readers.

AFRICA.

Fighting the Slave-hunters in Central Africa. By Alfred J. Swann. London: Seeley and Co., Limited, 1910. *Price 16s. net.*

An appropriate title to this interesting work would be "The Passing of the Slave Trader." It comes to us with the imprimatur of Sir Harry Johnston, than

whom we have no greater authority on Africa in general. Mr. Swann deals with the tangled story of Central Africa in the twenty-six years between 1882 and 1909, during which his duty constantly brought him into conflict with Arab slave-drivers, including the famous Tip-pu-tib and Rumaliza. From the very first he was in deadly earnest to undermine, and, if possible, to destroy the slave trade, which he justly describes as the curse *par excellence* of Africa, and this volume sets forth his methods and his success. The personal element is very prominent throughout the book, and yet there is no trace of boasting or self-glorification. The narrative abounds with varied incidents which sustain and gratify the interest of the reader. It is quite apparent that, notwithstanding the appalling misery and hideous degradation with which the author was habitually confronted, he was able to perceive and appreciate the better elements in the life and character of the natives, and even of the slave-drivers, whose ruin and, if need be, destruction were the objects of his life-work; and he anticipates a prosperous and happy future for regions where, a few years ago, life was a prolonged misery. Mr. Swann's tact and experience apparently recommended him to Sir Harry Johnston as a useful assistant in settling territorial and diplomatic disputes with the natives, and he was entrusted with the delicate task of making treaties with the chiefs at North Tanganyika. He was successful in this, but ere the despatches arrived in London "Europe had already partitioned Africa into 'Spheres of Influence,' and by international arrangement the much-coveted link in the chain, which would have given us a clear Cape to Cairo route, and which had been honestly signed over to me on behalf of Great Britain, fell to the lot of Germany and the Congo State. My keen disappointment may well be imagined by every true Imperialist, and although the thanks of Lord Salisbury and Consul Johnston were highly appreciated by me, they can never compensate me for the abandonment of that small red line, which was actually completed in a legitimate manner during the exciting time I have described, and which I should have been so proud to have seen drawn on the map of Africa." In an appreciative introduction Sir Harry Johnston bears testimony to the excellent work done by Mr. Swann in Africa, and of this book he says that it gives us "the romance of East Africa before it became tourist-trodden and vulgarised." A perusal of the book fully confirms this high encomium, and for this reason we heartily recommend the work to our readers.

In Dwarf Land and Cannibal Country: A Record of Travel and Discovery in Central Africa. By A. B. Lloyd. With Illustrations and Maps. Third Impression. London: T. Fisher Unwin. *Price 5s.*

This is the third impression of Mr. Lloyd's book on Dwarf Land. The simple, unaffected story of travel right across Africa, with a pause of a few years in Uganda, during the time wars raged ten years ago, and of a journey through Dwarf Land, has evidently met the popular taste, and called for reproduction. It is a story that deserves to live.

Africa: A History and Description of the British Empire in Africa. By Sir Harry Johnston, K.C.M.G., K.C.B., D.Sc. London: National Society's Depository. 1910. *Price* 10*s.* 6*d. net.*

The National Society showed wise discretion in their selection of Sir Harry Johnston as the writer of the history of that part of *Britain across the Seas* which is in Africa. Probably no greater authority on the difficult and tangled problems which perplex the students of the history of British Africa is now living. The

task was rendered all the more difficult because of the limitations imposed on the writer, for it appears that the history was "not to be too abstruse for young students (whose previous knowledge of Africa might be assumed to be elementary), nor yet too lacking in technical information to be of service to those who had left studenthood behind, but desired to learn rapidly how all these things came to pass in this continent of black, white and yellow peoples." On the whole, we think, Sir Harry has conscientiously and successfully carried out his instructions. His main difficulty must have been that of condensation, and his readers are to be congratulated on the discretion with which he has chosen for more detailed treatment the lesser-known periods of British African history, rather than those with which historical students are or should be familiar. He writes confidently and easily, with the assured grasp of the subject which is appropriate to one who has made it the study of his life, and who has taken a prominent part in many of its episodes. He has made a careful study of the life, character, customs, and languages of the natives, and the notes which are appended to several of the chapters are specially valuable. His breadth of view and accuracy of observation at once impress the reader, and his thoughtful generalisations are deserving of careful study. As an example we may quote a paragraph showing how the conditions of ages long past elsewhere are now existing in Africa, and may be observed and studied by the antiquarian, the ethnologist, and the student of natural history of to-day. "Africa is like a wonderful museum to illustrate the past conditions of life which have existed in our own country, and in Southern and Western Europe. In Madagascar we have still living lemurs or 'half-apes,' which in very similar forms are found fossil in France and Britain, dating from early tertiary (Eocene) times ; in West Africa we find beasts and birds characteristic of France and southern Germany in the Miocene ; in the rest of tropical Africa is now the marvellous vanished fauna of Europe and Western Asia in the Pliocene and Pleistocene. In Mauretania linger lions, leopards, hyenas, gazelles, porcupines, genets, and ichneumons, once found in Greece and the Balkan Peninsula, in Italy and Spain at the beginning of the Historical period. And with mankind in Africa it is the same thing. In Morocco and Tunisia we have the life and customs of the Roman Empire and the Middle Ages ; in Egypt (away from European civilisation) the continuation of Biblical times ; in many parts of the Sudan, East, West, and South Africa, we find a Neolithic type of culture of dwellings, arms, ornaments characteristic of Europe five to ten thousand years ago : and lastly, in the life of the bushmen and of the Congo pygmies we find almost exactly reproduced the existence of our Palaeolithic cave-dwelling ancestors in France and Britain at that remote period when only rude implements of wood, stone, and bone had been invented." Considerations of space prevent us from attempting even a summary of the many interesting and instructive historical narratives in this work. The work will do good service as an introduction to a more detailed study of the voluminous bibliography on the subject. The book is profusely illustrated with beautiful photographs, and is well equipped with excellent maps.

The Land of the Golden Trade (West Africa). By JOHN LANG. London : T. C. and E. C. Jack, 1910. *Price 6s. net.*

This is a realistic account of the history of West Africa, illustrated by coloured pictures. Pirates and the slave trade occupy a large amount of space, and the book seems to us to emphasise rather too much the horrible side of a dreadful period.

AMERICA.

The True History of the Conquest of New Spain, by Bernal Diaz del Castillo. Edited and Published in Mexico by Genaro Garcia. Translated into English by Alfred Percival Maudslay, M.A. Vol. II. London: Printed for the Hakluyt Society, 1910.

The second volume of the *Conquest of New Spain* continues the thrilling and exciting story of the advance of Cortes and his companions on Mexico, the capture and detention of Montezuma, the enforced return of Cortes to the coast and his victory over Narvaez, his return to Mexico, where he found the chiefs and inhabitants had risen against his lieutenant, Don Pedro de Alvarado, the death of Montezuma, the disastrous retreat from Mexico to the coast, the arrival of reinforcements, and the resumption of hostilities against the successors of Montezuma. The narrative ends very abruptly, showing that it is incomplete. The interest of the story never flags from beginning to end; and we have much additional light thrown on the character and doings of Cortes, whose rapacity and chicanery evidently sorely tried the loyalty of the simple old soldier, Bernal Diaz, the narrator. It is unnecessary, however, for us to say more, as in the issue of this magazine for February last we reviewed the first volume of the history at some length.

Through Afro-America. An English Reading of the Race Problem. By William Archer. London: Chapman and Hall, Ltd., 1910. *Price* 10*s.* 6*d. net.*

The question of the future of the negro is undoubtedly the biggest question with which the United States is confronted. Needless to say the literature on the subject is profuse and bewildering. But when a writer of the distinction of Mr. William Archer enters the lists, he is assured of a welcome on all hands. Nor will his volume disappoint its readers, written as it is with lucidity, sympathy, and wide knowledge.

The first part of the book states the conditions of the problem. Of the ten million blacks in the United States, some nine millions are to be found in the seventeen Southern States, where they form one-third of the population. Their distribution in these States is, of course, uneven, and it is where they are most numerous that the tension between them and the whites is greatest. Examples of the oppression of the negro are known to all — the Jim Crow car, the refusal of the vote, the frequent lynchings, growing unhappily more frequent. Yet Mr. Archer says, "the South is by a long way the most simply and sincerely religious country I ever was in."

In the second part of the book Mr. Archer faces the problem of how the admitted evil ought to be dealt with. Such Colleges as Hampton and Tuskegee (pronounced Tuskéeghee) will not remove it. He discusses and rejects in turn (1) the suggestion that the negro will in time die out; he does, however, incline to the view that the race will not largely increase, a point on which the census just completed will afford some light: (2) the possibility of the co-existence of the two races without friction, an aspiration for which the past gives no warrant; their interrelations are indeed becoming steadily worse: (3) fusion of the races. It is enough to say that intermarriage is forbidden by the laws of all the Southern and some of the Northern and Western States, and these statutes, the Americans hold, are founded upon the laws of Nature. In the end our authority is forced to the solution of segregation. "Four hundred million acres of Government land," he quotes, "is yet untaken and undeveloped in the West. Of these vast acres the

expert hydrographer of the Interior Department has reported that it is easily possible to redeem by irrigation enough to support in plenty a population of sixty million people." There would be no difficulty in filling the place of black labour with white, and the South would then "awaken, as from a nightmare, to the realisation of its splendid destiny." Of the urgency of the problem there can exist no doubt. At present "constant inter-racial irritation leaves neither race entirely sane."

The volume closes with a picturesque account of a visit paid on the return route to Cuba, Jamaica, and the Panama Canal, and this is by no means the least interesting portion.

POLAR.

British Antarctic Expedition, 1907-9. Under the command of Sir E. H. Shackleton, C.V.O. Reports on the Scientific Investigations. Vol. i. Biology. Editor, James Murray. Parts i.-iv. London: Published for the expedition by William Heinemann, 1910. *Price* 12*s.* 6*d. net.*

This first instalment of the scientific results of Sir Ernest Shackleton's expedition contains four articles:—"Collecting at Cape Royds," by James Murray, "Microscopic Life at Cape Royds," and "Antarctic Rotifers," by the same, together with an article on the Mosses by M. Jules Cardot.

Of these papers the most interesting from our point of view is the first, which by many little touches helps us to fill in the picture of life, and especially of the biologist's life, in Antarctic regions. One of the most instructive points perhaps in the whole is Mr. Murray's account of how the dredge and its ropes were kept at the bottom of the sea, in order to prevent them freezing! Equally interesting is the description of the process of "collecting" at the bottom of frozen lakes by means of shafts sunk through the solid ice. In the case of one lake, which was frozen down to the bottom, fifteen feet of ice had to be cut through. On the bottom, beneath the ice, living organisms were found, mingled with weed, among the angular fragments composing the lake floor. Such descriptions are of more value than whole tables of meteorological data in enabling us to understand the climatic conditions on the fringe of the Antarctic continent.

The majority of the collections made were necessarily obtained within an area of a few miles round the base camp. Various specimens were, it is true, obtained in the course of the more distant journeys, but detailed investigations were only possible near Cape Royds, and even these had to be carried on under great difficulties, and at the cost of considerable hardships. Mr. Murray acknowledges with gratitude the assistance he received from various members of the party, and the papers and illustrations show with what patience and scientific devotion he carried out his task.

At first sight the vicinity of Cape Royds seemed a singularly hopeless biological field. The seashore, so rich a field in lower latitudes, was absolutely barren, though marine animals appeared at depths of 1-2 fathoms. On land the penguins, the skuas, and an occasional snowy petrel relieved the monotony in summer, while Weddell seals occurred at all seasons. Land plants were represented on the higher moraines by a few stunted mosses and some tufts of lichens. Both in numbers and in character the mosses are strongly contrasted with the relatively luxuriant flora of high Arctic latitudes. On the other hand, the fresh-water lakes contained a very remarkable collection of organisms, and were by far the richest area on land. This wealth of life is associated with the presence of a water weed,

not yet identified, which is abundant in the lakes, and in its turn lodges rotifers, infusorians, water-bears and so forth. The rotifers especially were remarkably numerous, and are very perfectly adapted to the conditions existing, for they can apparently be frozen for years and will yet hatch if the temperature rises.

In the sea dredging was carried on in depths ranging from seven to eighty fathoms, with the results that large collections were made which are to be described by specialists.

The present volume is illustrated both by microphotographs (made in the Antarctic, and by drawings, and we cordially congratulate Mr. Murray upon its appearance, and upon the excellent work that he found it possible to carry out under Antarctic conditions.

The Siege and Conquest of the North Pole. By GEORGE BRYCE, L.R.C.P. & S. (Edin.). London: Gibbings and Co., 1910. *Price 7s. 6d. net.*

Beginning with Parry's expedition in 1827, the author gives in a condensed but most readable form the narratives of the various expeditions whose avowed objective has been the North Pole. All other Arctic expeditions are excluded, which makes the volume one of moderate size and none the less satisfactory to the general reader. The glamour of the pole has ever lured men on: it could not be otherwise, yet we feel that a volume like the present one will rather tend to a belief that the conquest of the pole is the aim and object of all polar exploration. A public which might read this well compiled volume with avidity might remain in ignorance of some of the most striking pages in the annals of polar exploration. Thus the author's plan naturally excludes all record of Franklin, of Amundsen, and of that latest polar hero, Mylius Erichsen. Accepting, however, the scope of the book, we may reasonably ask why there is no mention of Andrée, whose gallant balloon attempt is surely worthy of notice. Nor is there any record of the Swedish expedition in 1872 in the *Polhem* under Nordenskjöld, whose aim, though modified by force of circumstances, was to reach a high latitude.

But the volume is worthy of praise, and as regards dates, names, and facts seems to be commendably accurate throughout. There are chapters on the expeditions of Parry, Kane, Hayes, the *Germania* and *Hansa*, the *Polaris*, Nares, the *Jeannette*, Greely, Nansen, Sverdrup, the Duke of the Abruzzi, Peary, and lastly Dr. Cook. As to the last, the author charitably expresses the opinion that "it is impossible at present to pronounce a final judgment." Mr. Bryce has evidently studied carefully the original works of these explorers and has made a happy selection of the incidents worthy of record. The result is a volume that quite fulfils his modest claim, and he has not failed in his ambition to give "the reader an intelligent idea of the equipment and other means by which the work of exploration has been carried on." The omission of an index is an unfortunate defect, and the sketch maps, though nine in number, have been so much reduced in reproduction as to be legible only with considerable difficulty. Mr. Bryce would have improved his volume by adding references to the original works of the authors to which he advises his readers to turn.

GENERAL.

A Scamper round the World. By LADY MOSS. London: John Ouseley, Ltd., 1910. *Price 5s. net.*

This is an elegantly bound volume of 127 pages, which describes in a simple and artless fashion a journey from Genoa to Colombo, Singapore, Pekin, and

Japan, the return being made by San Francisco, Chicago, and New York. Its chief interest for the public is that it demonstrates—if further demonstration is needed—that this tour can now be accomplished not only without hardship, but without even the loss of any of the comforts of life.

Senior Geography. Questions by F. M. Kirk, B.A. Statistical Appendix by E. G. R. Taylor, B.Sc. Oxford: At the Clarendon Press, 1910. *Price* 1*s.*

This little pamphlet is designed as a kind of appendix to Dr. A. J. Herbertson's series of Oxford Geographies. We cannot help feeling a spasm of pity for the pupils of any "conscientious" teacher who may obtain it, but to persons of discretion the questions will prove useful; the Statistical Appendix contains an enormous mass of material, very useful to the same class of individual, if dangerous to others.

Fifty Years in Camp and Field. Diary of Major-General Ethan Allen Hitchcock, U.S.A. Edited by W. A. Croffut, Ph.D. G. P. Putnam's Sons. New York and London: The Knickerbocker Press, 1909. *Price* 16*s. net.*

This remarkable book is much more than a diary. It is rather a biography of a many-sided man, who played an important *rôle* in the somewhat lurid drama of the history of the United States during the first half of the nineteenth century, and during the War of Secession. General Hitchcock was a distinguished soldier, but unfortunate in this, that the wars in which he took an active part were abhorrent to him as unjust and unnecessary. Born in 1798, he was entered at West Point in 1814, and got his commission in the Artillery three years afterwards. From the very first he devoted himself to abstruse reading and study to an extent that now seems hardly reconcilable with the due discharge of his duties, and this devotion to abstract philosophy and speculation continued throughout his life. It was not long before he had an opportunity of showing his conscientiousness and fearlessness in the discharge of what he deemed his duty, for in 1827 he deliberately disobeyed an order from his superior officer on the ground of its being illegal. He was at once placed under arrest and removed from his post, whereupon he proceeded to Washington, and after a useless interview with the Secretary for War he appealed to the President, Adams, argued the point with him, and induced him to cancel the obnoxious order. This was the forerunner of many similar episodes in Hitchcock's career, for he never hesitated to expose fraud or injustice, or to stand up for his own or other people's rights, however exalted or influential were the wrongdoers; and the narrative shows that he had only too many opportunities of exercising his abilities in defence of others during the troubled times in which he lived. He was engaged in the shameful war against the Indians in Florida, and took an active part in the Mexican war, of which he says: "My heart is not in this business. I am against it from the bottom of my soul as a most unholy and unrighteous proceeding; but as a military man I am bound to execute orders. . . . I am very much disgusted with this war in all of its features. . . . I think it a step and a great step towards a dissolution of our Union. And I doubt not that a dissolution of the Union will bring on wars between the separated parts." The Mexican campaign was a terrible strain on his health, and laid the seeds of an illness which incapacitated him from active service. In the famous War of Secession General Hitchcock was twice offered high command—first, to supersede Grant in Tennessee, and second, to supersede M'Clellan on the Potomac; but the state of his health precluded his accepting either offer, and he remained at Washington as military adviser to President Lincoln. In 1866 he met with a bad accident—a fall, from

which he probably never entirely recovered, and he died in 1868. He was an omnivorous reader. Becalmed in the Bay of Mexico he, as a Captain, spent his time reading Hobbes, Hegel, Locke, Cousin and Kant, and philosophising on a future state. But we have said enough to indicate the characteristics and style of this curious book, which will be found intensely interesting to many of our readers as the self-revelation or confessions of a soldier-philosopher.

Wörterbuch der Deutsch-japanischen Umgangssprache. Von A. Seidel. Berlin: Märkischen Verlagsanstalt, 1910. Lieferung 1. *Preis* 1 *mark.*

We can only call attention briefly to the issue of this German-Japanese dictionary, of which the first part has been sent to us. It is intended to accompany the same author's Japanese Grammar, and the part sent to us includes some introductory matter and part of the letter A. The whole dictionary, of which English and French editions are to be issued, is to cost 10 marks to subscribers and 12 to non-subscribers (unbound), prices which seem remarkably reasonable.

Aus Natur und Geisteswelt. Die Sprachstämme des Erdkreises. Die Haupttypen des Sprachbaus. Von Dr. Franz Nikolaus Finck, Professor an der Universität Berlin. Druck und Verlag von B. G. Teubner in Leipzig, 1910. *Price M.* 1 *each; linen M.* 1.25.

The first of these small volumes contains a purview of the languages of the world divided into families and subdivided into groups. Doubtful points regarding the relationship of various groups are sometimes pointed out, but as a rule no definite opinion is pronounced. Thus, the connections of the Dravidian group are not discussed, though, indeed, the Basque language is categorically stated to be an offshoot of the Iberian. This little volume is a handy and convenient means of ascertaining to which group any language belongs, and the task is facilitated by a copious index.

In the second volume are given sketches of the structure of eight typical forms of language, and in the concluding chapter these types are compared, the varying methods of analysis of conceptions, and of the synthetical constructions of expressions being pointed out. That these types are not invariable is evident, and the author regards it as most probable that all existing languages had the same origin. While man has to a great extent been restrained by reverence for existing forms, each people has impressed its mental idiosyncracy on its speech. Much useful information and many interesting suggestions are condensed into a few pages.

The Home-life of a Golden Eagle. Photographed and described by H. B. Macpherson. With thirty-two Mounted Plates. London: Witherby and Co. 1910. *Price 5s. net.*

This beautifully illustrated pamphlet gives an account of the growth and development of a Golden Eaglet, which was studied by Mr. Macpherson with infinite patience, at close quarters, in the "dark and gloomy corrie" "in the heart of the Grampian range," where it was hatched. The subject can only be said to be geographical in that it deals with the finest of the birds of the Scottish Highlands, and in that Mr. Macpherson's text gives incidentally some sidelights on the climatic conditions which prevail in the heart of the Scottish mountains. Space therefore only permits us to congratulate the author on the wonderful success with which his patient devotion has been crowned, and to call the attention of all those interested in living creatures to his charming descriptions and photographs.

BOOKS RECEIVED.

The Handbook of Nyasaland, comprising Historical, Statistical, and General Information concerning the Nyasaland Protectorate. Second Edition (1910). Compiled from Official and other reliable sources. Demy 8vo. Pp. x + 288. *Price* 3*s.* London: Messrs. Wyman and Sons, 1910.

The Picturesque St. Lawrence. Written and Illustrated by Clifton Johnson (Picturesque River Series). Cr. 12mo. Pp. xi + 253. *Price* 5*s. net.* London: Macmillan and Co., Ltd., 1910.

Les Indes Néerlandaises. Par Antoine Cabaton. Demy 8vo. Pp. viii + 382. *Prix* 8 *francs.* Paris: E. Guilmoto, 1910.

Le Mexique et ses Mines d'Argent. Par Albert Bordeaux. Avec une carte et 16 gravures hors texte. Cr. 8vo. Pp. 11 + 295. *Prix* 4 *francs.* Paris: Plon-Nourrit et Cie, 1910.

A Guide to Chamonix and the Range of Mount Blanc. By Edward Whymper. With Illustrations and Maps. Fifteenth Edition. Cr. 8vo. Pp. xiv + 206. *Price* 3*s. net.* London: John Murray, 1910.

A Guide to the Valley of Zermatt and the Matterhorn. By Edward Whymper. With Illustrations and Maps. Fourteenth Edition. Cr. 8vo. Pp. xiv + 224. *Price* 3*s. net.* London: John Murray, 1910.

Down Channel in the "Vivette." By E. Keble Chatterton. With a Frontispiece in Colour and fifty Illustrations by Norman S. Carr. Demy 8vo. Pp. xxix + 217. *Price* 10*s.* 6*d. net.* London: Sidgwick and Jackson, Ltd., 1910.

Sport and Travel in Both Tibets. By Lady Jenkins. With Map and twenty-five coloured Illustrations exactly reproduced from the Authoress's original Sketches. Imperial 8vo. Pp. 87. *Price* 10*s.* 6*d. net.* London: Blade, East and Blades, 1910.

Sport and Travel in the Far East. By J. C. Grew. With eighty Illustrations from photographs by the Author. Demy 8vo. Pp. xiv + 264. *Price* 10*s.* 6*d. net.* London: Constable and Co., Ltd., 1910.

The Russian Road to China. By Lindon Bates, Junior. With Illustrations from Photographs. Demy 8vo. Pp. ix + 391. *Price* 10*s.* 6*d. net.* London: Constable and Co., Ltd., 1910.

The Oxford Geographies: A Physiographical Introduction to Geography. By A. J. Herbertson, M.A., Ph.D. Cr. 8vo. Pp. 120. *Price* 1*s.* 6*d.* Oxford: Clarendon Press, 1910.

Tillers of the Ground. By Marion I. Newbigin, D.Sc. (Lond.). Cr. 8vo. Pp. vii + 224. *Price* 1*s.* 6*d.* London: Macmillan and Co., Ltd., 1910.

Cambridge County Geographies: Dorset. By Arthur L. Salmon. Cr. 8vo. Pp. ix + 154. *Price* 1*s.* 6*d.* Cambridge: University Press, 1910.

Griebens' Guide Books: Munich and Environs, 1910-11. A practical Guide, with 2 Maps. Small 8vo. Pp. 94. *Price* 1*s.* 6*d. net.* *Belgium,* 1910-11. A Practical Guide, with 8 Maps. Small 8vo. Pp. 155. *Price* 3*s. net.* Berlin: Albert Goldschmidt, 1910.

The Statesman's Year-Book, 1910. Edited by J. Scott Keltie, LL.D., with the assistance of J. P. A. Renwick, M.A., LL.B. Forty-seventh annual publication. Revised after Official Returns. Crown 8vo. Pp. civ. + 1404. *Price* 10*s.* 6*d. net.* London: Macmillan and Co. Ltd., 1910.

Natal Government Railways: Report of the General Manager of Railways for the Year 1909. Natal, 1910.

Punjab District Gazetteers: Attock District Statistical Tables, 1907. Lahore, 1909.

Punjab States Gazetteers: Chamba State. Statistical Tables, 1904. Lahore, 1909.

North-West Frontier Province District Gazetteers: Kohat. District Statistical Tables, 1904. Lahore, 1906.

The Central India State Gazetteer Series: Gwalior, Indore, Bhopal, Rewah, Western and Eastern States. 11 vols. Calcutta, 1907-1908.

District Gazetteers of the United Provinces. Vol. II. *Saharanpur.* Allahabad, 1909.

Burma Gazetteers: Salween and Northern Arakan Districts. Vol. A. Rangoon, 1910.

Report on the Administration of Bengal during 1908-1909. Calcutta, 1910.

The following Diplomatic and Consular Reports have been received :—Trade, etc., of San Francisco (4459); Trade, etc., of Tainan (4460); Trade, etc., of Asturias, etc. (4461); Trade, etc., of Adrianople (4463); Trade, etc., of Vera Cruz (4464); Trade, etc., of Salina Cruz (4465); Trade, etc., of Madeira (4466); Trade, etc., of Nice (4468); Trade, etc., of Havre (4455); Trade, etc., of St. Louis (4462); Trade of Damascus (4467); Trade, etc., of Costa Rica (4469); Trade of Lisbon (4470); Trade of Jerusalem (4471); Trade of Pokhoi (4472); Trade, etc., Boston (4473); Trade of Rouen (4474); Trade of Corea (4475); Trade, etc., of Seville (4476); Trade, etc., of Dantzig (4477); Report on the French Budget for 1910 (4478); Trade, etc., of Faroe Island and Iceland (4479); Finances of Servia, 1910 (4480); Trade of Baghdad (4482); Trade of Stockholm, 1909 (4481); Trade, etc., of Lyons (4483); Trade of Rome (4485); Trade of Persia (4487).

Colonial Reports—Miscellaneous.—Imperial Institute. Foodstuffs (71). Report on the Hurricane of March 1910, Fiji (72).

Colonial Reports—Annual.—Weihaiwei, Report for 1909 (637). Cyprus, Report for 1908-1909.

Statement Exhibiting the Moral and Material Progress and Condition of India during the year 1908-1909 (Forty-fifth Number).

Publishers forwarding books for review will greatly oblige by marking the **price** *in clear figures, especially in the case of foreign books.*

NEW MAPS.

EUROPE.

ORDNANCE SURVEY OF SCOTLAND.—The following publications were issued from 1st to 30th April 1910 :—

One-inch and Smaller Scale Maps.—One-inch Map, third edition, engraved in outline. Sheet 114. Price 1s. 6d. Third edition, engraved, with hills in brown or black. Sheets 96, 101. Price 1s. 6d. each.

Six-inch and Larger Scale Maps.—Six-inch Maps (Revised). With Contours in black. Price 1s. each. *Ayrshire.*—44 NW., 70 NW. *Kirkcudbrightshire.*—20 NW.; 36 SE.; 37 SW., 42 SW.; 49 NE.; 50 NW.; 55 NE.; (56 NE. and 56 SE.)

1 : 2500 Scale Maps (Revised), with Houses stippled, and with Areas. Price 3s. each. *Ayrshire.*—Sheets XII. 10, 11, 12, 14, 15, 16; XIII. 8, 10, 11, 12, 13, 15; XVII. 6, 7, 11, 12, 13, 14, 15, 16; XVIII. 1, 2, 13, 16; XXII. 1, 3.

Note.—There is no coloured edition of these Sheets, and the unrevised impressions have been withdrawn from sale.

The following publications were issued from 1st to 31st May 1910:—

One-inch and Smaller Scale Maps.—One-inch Map (third edition), engraved in outline. Sheet 108. Price 1s. 6d. Third edition, engraved, with hills in brown or black. Sheets 108, 114. Price 1s. 6d. each.

Six-inch and Larger Scale Maps.—Six-inch Maps (Revised). Quarter Sheets, with contours in black. Price 1s. each. *Ayrshire.*—44 NE.; 46 SW.; 61 SE.; 67 SW. *Kirkcudbrightshire.*—13 SW., 18 SW.; 20 NE.; 22 SW.; 30 NW.; 37 NE.; 37 SE.; 48 NE.; 54 NW.; 55 SW. *Peeblesshire.*—18 SE.

1 : 2500 Scale Maps (Revised), with Houses stippled, and with Areas. Price 3s. each. *Ayrshire.*—Sheets XI. 11, 14; XII. 7, 8, 9; XIII. 5, 6, 7, 14; XVI. 1, 2, 3, 6, 7, (11 and 15), 12; XVII. 1, 2, 4, 5.

Note.—There is no coloured edition of these Sheets, and the unrevised impressions have been withdrawn from sale.

The following publications were issued from 1st to 30th June 1910:—

One-inch and Smaller Scale Maps.—One-inch Map. Third edition, printed in colours and folded in cover, or flat in sheets. *Applecross.*—Sheet 81. *Lochcarron.*—Sheet 82. Price—on paper, 1s. 6d.; mounted on linen, 2s.; mounted in sections, 2s. 6d. each.

Six-inch and Larger Scale Maps.—Six-inch Maps (Revised). Quarter Sheets, with contours in black. Price 1s. each. *Ayrshire.*—41 NE., 49 NE.; 52 NW.; (55 SW. and 55 SE.); 61 NW.; 61 NE.; 62 NE.; 62 SE.; 67 NE.; 67 SE.; 70 NE.; 70 SW.; 71 NW.

1 : 2500 Scale Maps (Revised), with Houses stippled, and with Areas. Price 3s. each. *Ayrshire.*—Sheets VI. 11, 15; VII. 14, 15; IX. 15; X. 3, 4, 7, (12 and 11), 16; XI. 1, 5, 6, 7, 8, 9, 10, 12, 13, 15, 16; XII. 5, 6; XIII. 2, 4, 9; XVI. 8; (XVI. 16 and XXI. 4); XVII. 3, 9. Sheets IX. 11, 16; Price 1s. 6d. each.

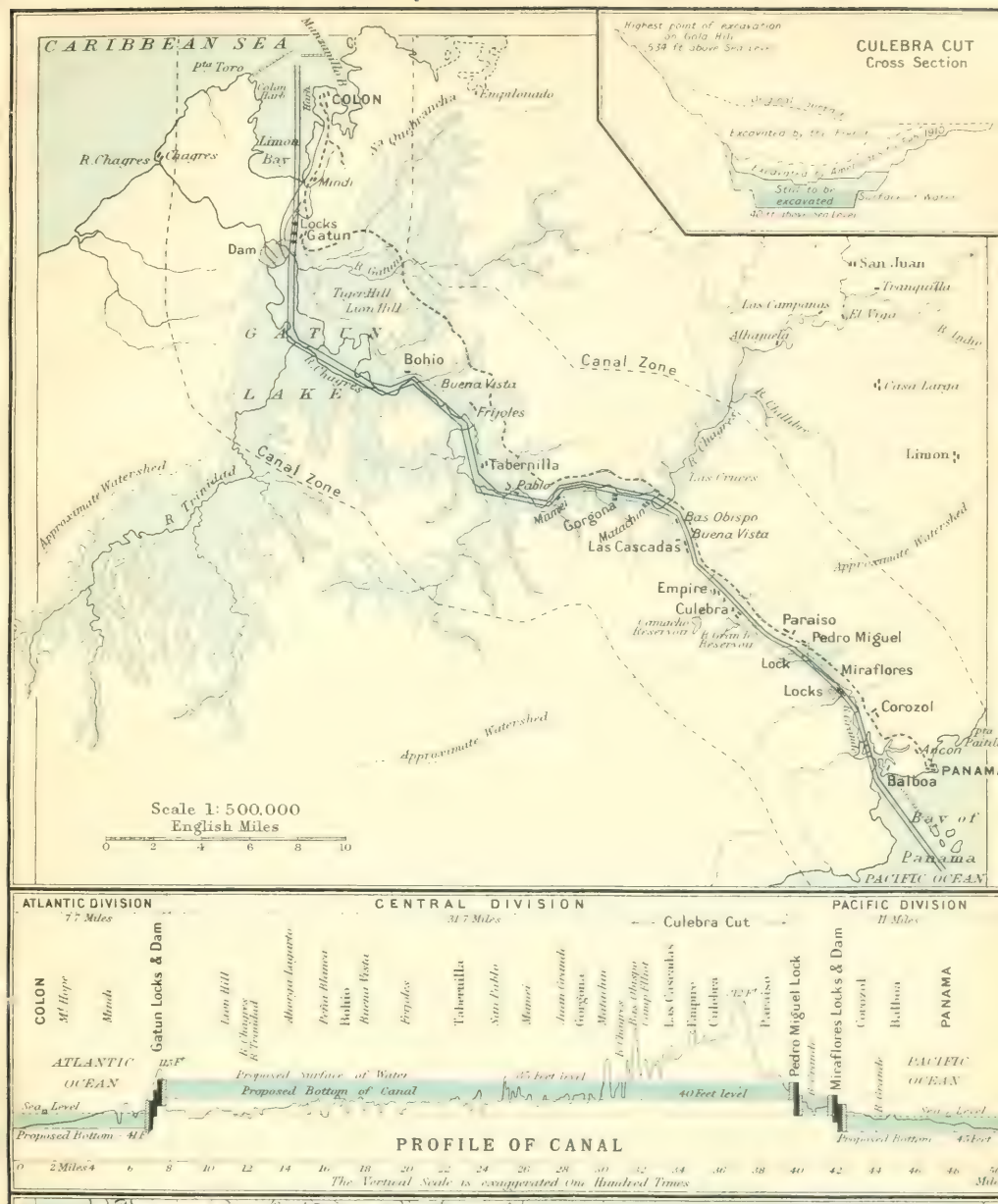
Note.—There is no coloured edition of these Sheets, and the unrevised impressions have been withdrawn from sale.

GEOLOGICAL SURVEY OF SCOTLAND.—The following publications were issued from 1st to 30th June 1910:—

Index Map.—Scale, four miles to an inch. Colour printed. Sheet 12. Price 2s. 6d. *Eastern Counties.*—Forfarshire, Parts of Aberdeen, Kincardine, Perthshire, and Fifeshire.

Geological Map.—Scale, 1 inch to 1 mile. Colour printed. *Isle of Arran.* Price flat or folded in cover, unmounted, 2s.; mounted, 2s. 6d.; or folded in sections, 3s. net.

Six-inch Maps, Quarter Sheets, uncoloured. Price 1s. 6d. each. *Lanarkshire.*—8 NW.


CARIBBEAN SEA
Pta Toro
COLON
Limon Bay
R. Chagres
Chagres
Mindi
Locks
Gatun
Dam
Tiger Hill
Lion Hill
GATUN
LAKE
Bohio
Buena Vista
Frijoles
Tabernilla
Pablo
Manzi
Gorgona
Matachin
Las Cascadas
Bas Obispo
Buena Vista
Empire
Culebra
Paraiso
Pedro Miguel
Lock
Miraflores
Locks
Corozol
Ancon
PANAMA
Balboa
Bay of Panama
PACIFIC OCEAN
Canal Zone
Approximate Watershed
R. Trinidad
Las Cruces
Las Campanas
El Viga
San Juan
Tranquilla
Alhajuela
Casa Larga
Limon
Scale 1: 500,000
English Miles
0 2 4 6 8 10
Highest point of excavation on Gold Hill 534 ft. above Sea Level
CULEBRA CUT
Cross Section
Excavated by U.S. 1913
Slope to be excavated
40 ft. above Sea Level

ATLANTIC DIVISION
7.7 Miles
CENTRAL DIVISION
31.7 Miles
PACIFIC DIVISION
8 Miles
Culebra Cut
COLON
Mt Hope
Mindi
Gatun Locks & Dam
Lion Hill
Chagres
Trinidad
Alhajuela
Pena Blanca
Bohio
Buena Vista
Frijoles
Tabernilla
San Pablo
Manzi
Juan Grande
Gorgona
Matachin
Chagres
Bas Obispo
Las Cascadas
Empire
Culebra
Paraiso
Pedro Miguel Lock
Miraflores Locks & Dam
Corozol
Balboa
PANAMA
ATLANTIC OCEAN
Sea Level
85 Feet
Proposed Surface of Water
Proposed Bottom of Canal
45 Feet level
40 Feet level
Proposed Bottom 41 Feet
PACIFIC OCEAN
Sea Level
Proposed Bottom 45 Feet
PROFILE OF CANAL
0 2 Miles 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
The Vertical Scale is exaggerated One Hundred Times

ATLANTIC OCEAN
Gulf of Mexico
MEXICO
New Orleans
Galveston
Matamoras
Tampico
Vera Cruz
Mexico
Acapulco
Manzanillo
Mazatlan
La Paz
San Blas
Guadalajara
Havana
Cuba
BAHAMAS
WEST INDIES
Jamaica
Belize
CARIBBEAN SEA
CENTRAL AMERICA
Panama
Trinidad
Caracas
VENEZUELA
Georgetown
Paramaribo
Cayenne
GUIANA
COLOMBIA
Bogota
Quito
Galapagos Is.
PACIFIC OCEAN
Clipperton I.
Revilla Gigedo Is.
Socorro
Guaymas
Chihuahua
San Antonio
Key West
Tampico
Merida
Campeche
Yucatan
Guatemala
Honduras
Nicaragua
Costa Rica
Maracaibo
Barbados
Martinique
St Lucia
St Vincent
Grenada
Curacao
Aruba
Tobago
Barbadoes
Demerara
Surinam
Cayenne
Rio Negro
Macapa
Guayaquil
105
90
75
60

THE SCOTTISH

GEOGRAPHICAL

MAGAZINE.

THE PRECIOUS METALS AS A GEOGRAPHIC FACTOR IN THE SETTLEMENT AND DEVELOPMENT OF TOWNS IN THE UNITED STATES.[1]

By George D. Hubbard.

Classes of Towns and Settlements.—In other papers the relation of the discovery and distribution of the precious metals to the movements of the people has been discussed,[2] movements both for the purpose of exploration, and of engaging in more or less fixed occupations. Here, the kinds of habitations and settlements, and the nature of the community groups formed where the influence of gold and silver was strong, will be treated. There were in the mining regions of the West camps and towns of all degrees of permanence, from the group of tents, staked for one or two nights' lodging, to the substantial and well-ordered city. There were mining camps, commercial centres, and outfitting stations, and towns and cities primarily for other purposes than to minister to the gold and silver mining industry. And not only the camps and towns, but the distribution of people and the character of rural settlements often show the effects of gold- and silver-mining. Probably every hamlet, town, and city in the whole West has been more or less modified under the powerful touch of the precious metals. Many would never have been at all; others would not have been so great; and possibly a few would have been of more importance; but each certainly

[1] This paper was prepared as a part of the requirements for the doctor's degree in geography at Cornell University. Thanks are hereby given to Prof. R. S. Tarr, Prof. W. F. Willcox, and Prof. H. Ries, whose valuable suggestions aided in giving it any virtue it may possess. [It was also submitted to Section E (Geography) at the Winnipeg Meeting of the British Association (cf. vol. xxv. p. 579).—Ed. *S. G. M.*]

[2] *Bull. Amer. Geog. Society*, vol. xlii., 1910.

bears, in its character and development, marks of the moulding influence of this powerful industry.

A number of causes operated to determine the nature and life-history of a miner's settlement. Its purpose probably functioned first. If it was to be a camp in a gulch, whither men had been collected hurriedly to wash auriferous gravel, the signs of permanence were few or entirely wanting; if it was a centre of extensive or expensive mining of complex ores, it had to be more enduring; if it was to be a provisioning centre for a group of diggings, it took on a somewhat fixed character and was classed as a town; if it was to be a commercial centre and the outfitting headquarters where new arrivals by land or water were to enter the region, its buildings were of a still more substantial kind, and its plan better worked out. But the first classification has not always been maintained. Founders' plans have often gone far astray, because not in harmony with the conditions.

Conditions and Character of Camps.—Camp conditions have been portrayed by many writers from earliest mining days to the present.[1] In some respects the conditions differ widely then and now, owing partly to differences in the kind of men who come to the camp; but in many respects there are characteristic resemblances. Placer mining conditions will be treated first, hence the following paragraphs are more applicable to the earlier mining days. Shelter was nothing more than shelter of the simplest kind; even rude houses in the early days were rarely built; but in recent times adjacent saw-mills make them possible in many places. The flimsy board shanty, the tent, stakes with a canvas cover, booths of branches, and often simply the thick branches of a standing tree, were all the miner took time to construct or appropriate. The warm and, for the most part, dry climate of California, where the gold first called for dwellers, made it possible to live with almost no shelter in summer, while severe winters sometimes drove the miner entirely out of the gulch. The shelters stood right in the gulch, or along the bar that was to be mined, as near as might be to the work that was to be done; sometimes in the way of future operations, sometimes arranged along a single street or path, sometimes irregularly scattered along the side of the valley. Planning a camp was usually not thought of. The men were too full of the present to plan for the future, and of self to think of the convenience of orderly construction. Their equipment consisted of a blanket or two apiece for the occupants, a frying-pan and a few other culinary or table utensils, a few boxes, bags or bundles of eatables, and, after matters were started, an empty box or two.

The element of camp permanence was at first very small in any locality, especially in the early days. This grew out of several conditions. The first work was usually done on gravels or ledges whose output was uncertain, and whose quantity of pay-dirt or ore was never known until it was practically exhausted. Men expected to mine what

[1] T. A. Barry and B. A. Patten, *San Francisco in the Spring of* 1850, 1873. H. H. Bancroft, *History of California*, 1884. 7 vols. Bret Harte, *Many Poems and Stories of Western Life*. See Works. C. H. Miller (Joachin), *Poems*, 1882. Bayard Taylor, *Eldorado*, 1857.

was there, and move on. Then the miners were anxious to make the most of every moment. The time lost in building a house put one far in the rear. A third reason was the excitement induced in most camps by the gold. It was not a matter of reason whether to build or to mine. Hardly any one who entered a camp could keep from using a pick and shovel. The temptation to mine was too strong to be resisted for the sake of a little more present comfort. Fourth, the great disparity of the sexes, a fact already traceable largely to the geographic conditions under which the gold occurred, was in turn a cause of the spirit of unrest and the free movement from place to place. If a single man thought he could do better elsewhere, he was free to go and try. Again, the simple methods of mining, begotten of the conditions of occurrence, favoured, for two reasons, the moving about from gulch to gulch. In the first place, throughout the California placers the conditions and requirements were so similar that no one need stop after moving to learn new methods. Secondly, for placer mining one's whole outfit could be tied up in a blanket and carried to a new place. This condition disappeared when the more complicated processes came into use, but in the early history—in the placer stage—permanent settlements were almost out of the question. And had there been only placer deposits, the boom of any State or region would have been ephemeral.

There was little division of labour. Nor was there a labouring class; everybody was a proprietor. Because education and experience counted for little—so simple was the mining process, and so blind the clue to rich pockets—professors of geology, newspaper men, lawyers, physicians, sailors, masons, accountants, and farmers, all worked side by side. Because of this same simplicity in mining process, and the opportunity for any one to "strike it rich," the poor man preferred to work independently and run all risks rather than to hire out and thus be sure of what the rich man was able to pay. And the rich man was compelled to work himself because he could not afford to hire. He could not pay what the labourer with his chance for success thought he could make alone. All this, with the common risk and speculation and the universal gold-begotten excitement, tended to produce the social equality of the camp, so marked a feature of the early California days.

In spite of the social equality, however, some division of labour arose early. Those who had an eye to business, and were willing to forego the thrill of plucking the yellow rock from the gravels, and at the same time to avoid the exposure incident to actual mining, engaged in other occupations as essential to the success of the camp as mining, and often more certainly lucrative. Some entered the carrying trade. A man and a mule sometimes made $3000 in a month. Three Yankees established a ferry across the San Joachin river, and took from $500 to $1000 daily. They charged $2 for carrying a man and horse across.[1] It was not extortion to charge such prices and reap the reward thereof. The miners were making money as rapidly and were perfectly willing to pay. The shrewd non-miners simply hit upon an occupation for which the condi-

[1] Bayard Taylor, *Eldorado*, 1857, pp. 75, 98.

tions gave a ready market. Keenness for gold was an element of the atmosphere in which society moved.

Frequently one member of a camp ran a gambling establishment, and every town had an abundance and variety of gaming-tables. After 1848, robbers, camp-thieves, horse-thieves, and lawless characters were to be found, but Shinn[1] says that there was probably less crime in California during the first summer than in any summer before or since. This fact has been attested by a number of writers, and is probably due to several causes. Most of the men were near home, and were among friends and neighbours; the foreign elements had not yet arrived, because the influence of the metal had not yet gone far. An excitement, a sort of spell, was over the region. The fascination and witchery of gold-mining held universal sway. Every one was anxious to see what would develop. He preferred to be out knocking about in the ravines to find a bigger pile than his neighbour, than to be robbing him of his find. Then, too, theft was made a capital offence in many districts. It was very easy to take a thousand dollars from the gravel, and many times safer than to take it from some miner's tent. Further, there was a romance in recovering such valuables from the stream-beds. It is no wonder that there was so little theft during these early months.

Owing to the freedom and the independence of endeavour in the mining camps, each man's will and power was his law. Disputes and quarrels, even duels and murders, occurred in the camps, but were not common. As a rule the early camps were much more peaceable than would be expected. In recent times lawless tendencies are even less violent than in the fifties. Two reasons seem to explain the fact: (*a*) Law and order are not now in the hands of the camp, but are functions of the State and local civil organisation, because these institutions have had time to develop over most of the West; (*b*) Camps as such are largely replaced by towns gathered around some huge mining and reducing plant, which location gives the place a feeling of permanence and security. Of course, many times the rough brute side of human nature displays itself vehemently, but respect for law by loyal citizens is the rule not the exception.

The tendency to fast living, a product of extreme optimism and unbounded faith in mining, is still found in mining camps and towns; but it is not so strong as in the early days in the newness and wonderfulness of the whole episode. Men made their money easily and rapidly; they were in the exuberance of young manhood. They were away from family, and even civil restraint; they were excited, feverish, often delirious with the infatuation for gold, and were not themselves. Besides, the tendency to fast living often expressed itself in drunkenness and gambling.

Special Types of Camps.—Special local conditions gave rise to camps of peculiar character. The Southern Appalachian region and places in the arid region will illustrate this point. In Georgia and the eastern

[1] C. H. Shinn, *Mining Camps: A Study in American Frontier Government*, 1885, pp. 119, 120.

States generally, the gold was discovered in well-settled and organised regions, and among many other occupations, where, because of the scarcity of gold, mining had to remain a minor industry. Hence men worked in the mines and gravel deposits between other regular work, but did not follow the business all the year round.[1] They could make more on their farms in the growing season than from the mines with their low grade ores; and, therefore, the camps were occupied only intermittently. At present, however, expensive mining and reduction plants which operate all the year round have been introduced at several mines.

Another intermittent type of camp occurs in some places in the arid south-west. Gold gravels occur in stream-beds where the flow of water is not continuous. A heavy downpour of rain may give the creeks a sudden, strong flow, which gradually dwindles to nothing, to be revived months later by the next heavy shower. During the dry season the men go up the ravines and get a large quantity of gravel out ready to sluice when the water comes. Then they return to the valley farms or ranches, and work at something else till the approach of rain. On its arrival all hands break for the sluices and wash gravel as long as the flow of water permits. Occasionally the signs of rain are good, and the men hurry to the gravel piles only to find that there is not enough rain to reach their diggings: or the storm comes in the night, and the water, having no one to control or use it, sweeps away the accumulations of months, and all is lost. Mining is the industry the men are there for, but owing to the special climatic and geographic conditions they cannot follow it continuously. These peculiar conditions of camp life and work are not common enough to effect the total output, but they illustrate one phase of geographic influence on the character of the camps.

Succession of Camp Occupancy.—In the normal order of things in the gold-mining States, the prospector has always been the first man on the ground. During the early days his voluntary services opened the way for the miner and the capitalist. He found and marked the deposit; miners began its development: capital came and bought as cheaply as possible: but the capitalist himself rarely searched for the deposits. In modern times the function of the prospector, with his peculiar training and development, is well recognised. Many of the large mining companies employ prospectors whose sole business is to scour the hills and ravines for more gold, silver, or copper. Of the several types of men developed under the special conditions, each finds place in the changing economy of gold and silver mining.[2]

Development of Permanent Camps.—In harmony with the permanence of form assumed by the industry, the permanence of camps increased. While all the work in a region was placer mining, the camp could not take on an enduring character: but, as the processes inevitably changed in many localities from the elementary operations of washing gravel to the more advanced, complicated, and expensive methods necessarily

[1] J. D. Whitney, *Metallic Wealth of the United States*, p. 118.
[2] H. H. Bancroft, *History of California*, 1884, vol. vii. p. 655.

employed in quartz mining, and in the extraction of values from even more complex ores of silver, very naturally more fixed camps and habitations sprang up around the more stable establishments. In some cases vigorous, substantial, well-organised towns have developed from these flimsy, temporary beginnings. Butte, Montana, a placer town of shabby miners' cabins in 1864, was given a copper smelter in 1866, and began its more extensive development in 1875. Five years later it had become a substantial town of 5000 people, and its population had doubled again by 1885.[1] In 1900 Butte contained over 30,000 people. Leadville, Colorado, with its predecessor Oro, furnishes another example. This now important mining centre rose in three years from nothing in 1877, through the placer stage to a town of 15,000 people in 1880, and that in a wilderness at an altitude of 10,000 feet. It all came in response to the impetus of silver and associated ores.[2] Cripple Creek, Colorado, and Deadwood, South Dakota, with a number of smaller purely mining towns possessing a permanent character, may be added to the list. Potosi, in Bolivia, sprang up from almost nothing, under the influence of the exceedingly rich silver mines of the mountain, to a city of 160,000 inhabitants, and this at an altitude greater than that of Mt. Blanc. The result was marvellous, and would have called forth comment even had it occurred under favourable circumstances, but under the actual conditions it scarcely seems in the realm of the possible.[3]

Virginia City, located on the Comstock lode, has been in character a permanent city from its foundation, because it was built in connection with the development of the great silver-gold mine below it. Many of the difficulties in the way of the development of the mines restrained city building. But a city must be had, because the mining required it. The town began very soon after the discovery of the lode in 1858, and, under the impetus of the great inrush of miners and others from California, grew very rapidly, so that in 1870 and 1880 it had a population of about 10,000. Its supplies had to come by wagon from California; its lumber for buildings over sandy wagon-roads for 20 miles; its water-supply was at first brought 12 to 15 miles in wagons, and later, at an enormous expense, from lakes in the mountains 20 miles away. No agricultural land near by contributed food, for all around was barren, parched, deserted wilderness. And yet the city rose in ten years to 10,000 people.

But when the mine ceased to produce, because the great obstacles encountered were then unconquerable, the city declined, and it is now but a shadow of its former short-lived greatness. The region, although once considerably improved, has reverted to wilderness. The close relation between the mining industry on the Comstock lode and the growth and decline of Virginia City and its associates, cannot be more clearly seen than in the accompanying Table.

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[1] H. H. Bancroft, *History of Washington, Idaho, and Montana*, 1890, pp. 740, 752, 764.

[2] R. P. Porter, *The West from the Census of* 1880, 1882, p. 373. *United States Geological Survey*, Monograph XII., pp. 14 *et seq.*

[3] J. D. Whitney, *Auriferous Gravels*, 1854, p. 171.

PRODUCTION OF COMSTOCK LODE AND POPULATION OF THE THREE TOWNS IN THE VICINITY—VIRGINIA, GOLD HILL, AND SILVER CITY.

Date.	Population (approximate).[1]	Production in oz.[2]
1859	a few	30,000
1860	4,000	1,000,000
1870	13,000	3,000,000
1877	21,000	36,000,000
1880	15,500	5,000,000
1881	...	1,000,000
1890	9,000[3]	5,000,000
1900	3,000[3]	1,000,000

This city is only a giant of a common type. Towns were built hurriedly, badly, and extravagantly, as the mining industry grew, because everybody had full faith in the prosperity of the mine. After a more or less successful and extended boom, the mine in many cases began to decline, and with it the town. Abandoned claims, camps, and towns are to be found all through the Western mountains, and every year adds to the list.

Commercial and Outfitting Centres.—A class of places in very close contact with purely mining camps and towns contains a long list of distributing and outfitting towns all over the West, from Denver to the Pacific. Stockton on the San Joachin, and Sacramento on the Sacramento, both at the foot of the slopes leading eastward up to the mouths of the Sierra gulches and valleys, were two of the earliest of the class, and will serve to illustrate their characteristics. Each was within fairly easy reach of a number of mining camps, whose wants they supplied. Each had water communication with the sea and with that greater emporium, San Francisco. Each sprang up at a point where goods and people could no longer go in large masses, but must scatter to the individual camps. Merchandise and miners, transferred to river steamboats at San Francisco, were carried up the rivers to either of these places, and again transferred to heavy wagons or pack-animals, and then laboriously hauled out to the various camps.

Stockton was a canvas town in 1849, but also a commercial centre making very perceptible growth in the course of a week. Taylor[4] predicted its success as a distributing point, because of its central position and means of transport. The mining camps demanded a centre somewhere in the vicinity, and this point had the requisite position. The enormously rapid increase in population and output of the tributary mines was closely followed by the expansion of the town. Shinn[5] says it increased from a single ranch house to a canvas city of a thousand people in three months. For several years it was flooded with transients and with merchandise, because of its relation to the camps. People and

[1] Becker, Monog. III., U.S.G.S., p. 4.
[2] Lord, Monog. IV., U.S.G.S., p. 416.
[3] Eleventh Census.
[4] B. Taylor, *Eldorado*, 1857, pp. 98, 99.
[5] C. H. Shinn, *Mining Camps*, 1885, p. 137

goods destined for camps came here by boat faster than they could be despatched to the gulches. It never collapsed so completely as did others when the mining in its tributary gulches declined, because of its early-developed agricultural interests.

Sacramento also experienced a phenomenal evolution. In April 1849 there were four houses on the site; in November there were hundreds of tents, shanties, and respectable houses sheltering ten thousand people, most of whom were transients, some just arriving in California, others returning for the winter from their summer's digging. The town, apart from these diverse residences, consisted of a few stores and large platforms for handling freight, which were clustered along the river, while the unsightly collection of abodes was scattered along the flood plain for a mile.

Like Stockton, its business demanded that it should be close to the stream, and therefore, like its twin, Sacramento was frequently flooded by the sudden rise of the torrent-fed river. Its hasty construction, due to enormous and imperative demands for greater commercial and hostelry accommodation, and to the feverish excitement of its business men, resulted in many carelessly built, inflammable structures. Hence fierce and destructive fires ravaged the city. Fabulous prices prevailed. Carpenters struck because they were getting only $12 a day. This price for labour, low compared with that in San Francisco, was due to the return of many disappointed miners who temporarily overstocked the market.[1] Single town lots were held at from one to three thousand dollars, when scarcely a house in town was actually worth that amount. As the time passed, buildings, expensive because of the great demand, the cost of labour, and the scarcity and expense of building materials, quickly replaced the tents and shanties. Prices were pushed too high, business became unsteady; the town surged with speculation, and became uproarious with traffic; profits reached 100 per cent. above rates accepted in San Francisco, and rents ruled as high as $5000 dollars a month for moderate buildings, while lots crept to $30,000 in the summer of 1850. In September 1850 this enormous inflation of values was followed by a terrific collapse. Similar crises, though less tense, arose again in this city and in other commercial centres. Floods, fires, and failures were the common city disasters. Sacramento, in a large fertile valley, did not experience the customary collapse on the waning of placer mining, because of the early utilisation of the agricultural possibilities, and because of its position as the State capital. It is to-day the capital, and a centre of considerable trade in agricultural supplies and products, which far outweighs its purely mining interests.

Other commercial centres of this class are Denver, Walla Walla, Lewiston, Fort Benton, El Paso, and even Salt Lake City. Denver is said to have sprung from a stage station to a city almost in a night, while a long line of mining towns rose along the eastern base of the Rockies.[2] Walla Walla was the outfitting station for the camps in the

[1] B. Taylor, *Eldorado*, 1857, pp. 220, 221.

[2] R. P. Porter, *The West from the Census of* 1880, 1882, p. 373.

rich Boise basin and Owyhee valley, and Lewiston supplied the Salmon and Clearwater valleys.[1] Fort Benton, at the head of navigation on the upper Missouri river, was destined to be a commercial centre as long as river traffic continued: but its character as an outfitting and provisioning centre was determined by the discovery of gold in Fergus county, and especially in the mountains west of the fort. The place was but a fort and fur-trading station prior to the outbreak of Montana's gold fever, but by leaps and bounds it rose to the rank of a town, and even bade fair to be a city of note within a few years. The impetus of the mining industry was too great for the good of the growing town, for the arrival of the Northern Pacific railroad, required just at this time and place by the new industry, robbed the river of its traffic, and at the same stroke removed Fort Benton's excuse for existence. Hence it has declined, and Great Falls has risen as a manufacturing and smelting centre.[2] Seattle, in Washington, and Vancouver, British Columbia, bear the same relations to the Alaskan camps that the above towns bore to their respective regions.

San Francisco and the Influence of Gold.—San Francisco, one of the largest cities on the Pacific coast, is in its entirety a response to the influence of several classes of environmental elements. Founded in 1835 by an Englishman who built his own little group of houses, and augmented in the following year by the single structure of an American, the great commercial emporium began its existence. The Hudson Bay Company took advantage, in 1841, of its position, and established a branch house. Its growth up to January 1848, the date of Sutter's discoveries, amounted to about two hundred houses set along well laid out streets and squares, with a population of less than a thousand; but in many respects it was one of the most thriving towns in California. Its people, chiefly Americans, were hardy, determined pioneers—backwoodsmen, artisans, seafarers, traders, and a few professional men. The town never was Mexican although under Mexican colours at the start, but there were a few scattered Spanish-Mexican mission settlements near.[3]

The locality was marked by Nature for a commercial centre, and, with the elements of commerce provided, promised to be a metropolis. It lay on the only natural harbour between San Diego and the mouth of the Columbia, and almost midway between them. It was in the gateway to a rich, fertile valley of enormous dimensions, bathed in salubrious air, a valley nearly closed to the east by mountain and desert barriers, and walled in on all sides by almost continuous ranges. Other harbours south of the Columbia had less of value in their hinterland. It of necessity had a monopoly of the trade of the State of California. Then its western outlook was toward the millions of the Orient just on the verge of their awakening. Naturally, a city would some day arise on this bay. Where would it be? The farther or inland side was too shallow for sea-going vessels, as were also the mouths of the rivers. The north side of the gate-

[1] H. H. Bancroft, *History of Washington, Idaho, and Montana*, 1890, pp. 406 *et seq.*

[2] H. M. Chittenden, *Early Steamboat Navigation on the Missouri River*, 1903, vol. i. p. 237.

[3] H. H. Bancroft, *History of California*, 1884, vol. vi. pp. 6, 7.

way was steep and rocky; the south was gently rising, and on the eastern side of the ridge, between the bay and the sea, there was a broad, low area stretching along the coast for some miles with depth of water before it sufficient for the merchant marine of those days. All this aided in determining the spot. Now, in 1848, all was like a great machine in place in the mill, but with no grist and no power. California's total American white population was about two thousand. No resources except furs, lumbering, and a very little agriculture were known, and these were undeveloped. The land was sparsely settled, unknown, and insufficiently watered for agriculture. Moreover, if development had depended upon the normal processes of migration and frontier evolution, against such heavy odds, it is hardly likely that fifty years would have accomplished what was done in five or six.[1]

Suddenly and vehemently came the impulse which created excitement and chaos not only in the city but throughout the entire State and even thousands of miles beyond her undefined boundaries. Gold was found in gravels so marvellously productive and so easily worked, that anybody with a pick, shovel, and pan could gather from ten to a hundred dollars worth a day, and ran the chances of finding ten times as much in one hour. And San Francisco had a corner on all trade, passenger as well as freight, for all the developing industry of valley and mountain-side save that which crawled slowly across country in wagons.

Her first response was a rush of almost her entire population to the diggings across the valley, but in a very short time an incoming rush of immigrants replaced the loss. From less than 1000 in the spring of 1848, she grew to 15,000 in the early fall of 1849;[2] from a group of dwellings, stores, and little warehouses she became a great commercial city; from a quiet fur-trading station to a centre of international trade and cosmopolitan enterprise and life. Every vessel in 1849 brought passengers, and the harbour was crowded with the shipping of almost every nationality. Goods and provisions were hurried to her wharves and into the streets. There were not half buildings enough to house the supply. Tents, and canvas or rubber-covered frames, piles of empty boxes, sheds, houses enclosed on three sides, and buildings in every stage of construction, and of every conceivable cheap pattern, might be found. From fifteen to thirty houses were built in a day. At least seventy-five were imported from Canton and were erected by Chinese labour. Streets stretched out up the hill to-day; and to-morrow their flanks were cleared of chapparal, hemmed in by a double row of houses, and thronged with people and goods. New warehouses sprang up, and new piers were reaching farther and farther out into the thickening and enlarging forest of masts; and the noise, motion, and bustle of business and labour were incessant.[3] And all this in a place where lumber and even houses were imported; where a year before there was not even a saw-mill; where agriculture had no footing, and civil organisation scarcely existed; where

[1] J. S. Nicholson, *Effects of Great Discoveries of the Precious Metals*, 1887, pp. 38, 39.
[2] B. Taylor, *Eldorado*, 1857, pp. 203-5.
[3] *Ibid.*, pp. 109, 110.

both labour and materials were exorbitantly high; in fact, where almost everything but enterprise and gold-dust were lacking. All else was hurrying thitherward on the demand of these. Taylor estimates that the values expended for materials, labour, and lands would have built on the Atlantic coast a well-established and organised city of 100,000 people.[1]

The constant stream of immigration brought every class from every land until one could see in the streets a throng as "diverse and bizarre as the houses" beside them—Yankees of every possible variety, and frontiersmen from all over the middle West, native Californians, Chilians, Sonorans, Kanakas, Chinese, Malays, and scores of others so browned and grizzled that their nationality was unrecognisable. Such a cosmopolitan population gathers in a commercial centre; but it was found here before the city became a commercial centre, and hence it must be ascribed to some other cause. Commerce came later when the market was ready. If the people themselves be consulted, they will answer that they were attracted by the stories of the gold discoveries.

Then the spirit or humour of the people was characteristic. The general excitement, good nature, and buoyancy have been remarked by all writers. There was a restless spirit, too, in those men, a bustling, energetic manner; energy to spare, a genius and an adaptability, rarely met with elsewhere. Men with little material to do with did what they could. Their buildings were a testimony to the use of makeshifts. Men were willing to put up with any convenience or inconvenience, for the sake of being there.

Prices and rents soared to fabulous heights. Taylor[2] tells of his garret-room beneath rafters, with home-made chairs and bed frame, which he shared with another man, and for which they paid $25 each a week. They paid $20 a week for board. A hotel—board structure, two or three stories high, and no conveniences—let for an aggregate of $110,000 per annum. A canvas tent, 15 by 25 feet, used by gamblers, let for $48,000 per annum. Shinn[3] says the Parker House in San Francisco cost $30,000 to construct, and let for $15,000 a month. Labour cost $10 to $15 per diem, and some kinds even more. Trade in that evolving city was spasmodic. Merchandise, becoming scarce in the abnormally stimulated market, could command fancy prices; then the arriving of new stock would often over-reach the demand, and prices might decline far below cost. Of course, much of this irregularity in the supply and demand was due to the isolation of the place; for gold-mining was calling into being a city remote from all else, but near the miners. Telegraph, cables, and telephones did not connect the city with eastern markets, nor did rapid transportation bring new stock to a depleted market. A stock of merchandise exhausted in any line remained so, barring any chance arrival of the article wanted, until word could be carried to market and the goods returned—three months at a minimum.

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[1] B. Taylor. *Eldorado*, pp. 203-5.

[2] *Ibid.*, 1857, pp. 54 *et seq.*

[3] C. H. Shinn, *Mining Camps*, 1885, p. 138.

While San Francisco was so shut off from the outside world, she kept in close touch with her subordinates. With those sub-centres of commerce, supplied through the seaport, she was in frequent communication by wagon and pack-animal. Like other towns of the mining region, San Francisco's life and spirit pulsated with the life about her; and, while she may have more than kept pace with the country in material progress, she felt particularly the changes in trade currents as mining interest rose and fell in tributary districts.[1]

And so the city grew. Her hasty and flimsy, but extravagant construction incorporated much bad planning, from which she suffered many things later. Severe conflagrations were so common that the sixth had occurred before the end of June 1851. Each time she built better and endeavoured to protect herself more adequately. Municipal affairs could not be organised fast enough to keep pace with the needs of the city; hence the chaotic and corrupt condition of administration and control may be ascribed to the influence of gold within her environment. The wave of flush times formed an incentive to disorders due to the incoming of idle workmen, and this in turn called for vigilance committees. Change was the order, both of officials and of form of organisation. Rivalry and abuse, supported by strategy, intrigue, and greed, succeeded in rolling up a city debt of over a million within the year ending February 1851.[2]

The first six years were a period of herculean achievement—hills were levelled, marshes filled, streets paved, the sites of smouldering ruins were covered with more substantial buildings, and order and system were gradually evolved from the most heterogeneous mixture of humanity and organisation ever collected in so few years. A commercial metropolis was formed, ranking well with the world's master commercial centres. And all was brought about against heavy odds. Unscrupulous officials, fires, lawless ruffians and vigilantes, debt, bad land titles, inflated land values, and emigration of thousands of men to more lucrative fields —these were her opponents, but she mastered them.

A crash in 1853, on the summit of the enormous inflations associated with the maximum gold production, shook the civil and social fabric as well as the financial structure, but only shook it together the better. It initiated many industries; miners entered farming of various kinds and helped to supply the city's needs. Manufacturing of candles and furniture, sugar refining and whisky distillation, founding and machine making, became notable industries in the city. She has grown and incorporated until a few years ago her population was over 350,000, and her rank was easily the first on this side of the Pacific. And had it not been for her location along a line of earth-crustal movement, no doubt she would have maintained her leadership. Her business, especially commercial and manufactural, is dependent to a considerable degree upon the mining industry even at present. Her commerce, in part, concerns itself with the handling of imported mining supplies, and her

[1] H. H. Bancroft, *History of California*, 1884, vol. vii. p. 682.
[2] *Ibid.*, vol. vi. pp. 164-220.

manufacturing with the making of many machines, materials, foods, and equipment for the mining industry.

While her present prosperity and national as well as international relations are due to her position and the products of the industries around her, it must be admitted that the development of these industries and the presence of the city in this generation are largely due to the stimulation of the gold-mining industry. Had no gold been found in the vicinity, there would have been little need as yet for such a mart.

Settlements and Towns remotely related.—Not all camps or settlements whose beginnings may be credited to the influence of gold and silver, were placed in the metal-producing localities: but, just as in other great migrations a few travellers turn aside from the trail to make permanent settlements, so here occasionally fertile mountain valleys and beautiful parks were settled long before the United States frontier in its normal agricultural development could have reached the position.[1] Some of these were occupied by families, *en route* for California, who became stranded, others by families whose enthusiasm had brought them thus far, but, becoming exhausted, permitted them to make permanent settlements and to begin farming, grazing, or lumbering, or all three, out in some charming but isolated locality. This halting sometimes led also to the discovery of new sources of wealth, minerals of various sorts, or interesting crop possibilities: but this always took place in advance of the general onward march of the agricultural frontier of the West.

So far as their relation to the precious metals is concerned, all other towns belong to one of two types. The first is that of Anaconda, Pueblo, and Tucson, with no mining at all. These towns were founded primarily for refining the ore, and many of their people work in great ore-smelters. Such towns are absolutely necessary to the progress of the mining business, because without places near the mines where the ore can be reduced, the industry cannot be carried on. These towns owe most of their development and present business to their relation to mining.

The other class consists of places, often founded before the discoveries of gold, whose business has come to be in some way tributary to mining, and hence stimulated by it. Such places are Astoria, Tacoma, Oakland, San Diego, Los Angeles, Santa Fé, Colorado Springs, and many others. It may be said that probably no city or town west of the 105th meridian is what it would have been without any gold or silver in the West. Most of them would as yet have had but little reason for being. Many of them were enormously stimulated indirectly by the immigration, commerce, agriculture, manufactures, and railroad development, themselves quickened by the presence and exploitation of gold and silver.

Metamorphosis of Towns.—An interesting change of character has taken place in the case of several of these mining camps and local commercial centres because of the influence of gold and silver. Benicia, at the mouth of the inner bay into which the Sacramento and San Joachin rivers flow, promised to be the commercial centre of that region: but in spite of her many advantages of position, San Francisco received the

[1] C. H. Shinn, *Mining Camps*, p. 134.

passenger traffic when the ships came in 1849-50, because the latter wa nearer the sea and most of the vessels could not reach Benicia. San Francisco very soon outstripped her ambitious rival, who humbly retired to the rank of a quiet county seat. The gold excitement overruled Benicia's plans, made so quietly and securely. San Francisco, a child of circumstances, took the palm from the city of plan and design.

Placerville and Eldorado were purely mining towns. The former was famous under the name of "Hangtown," and sustained the first mob tribunal in 1849. It was very rich in 1848, and increased in 1849, but soon after began to sink because of the failure of the placers, and in 1856 it had passed from a rich flourishing town of brilliant promise, through abandonment, fire, and flood, to rise again more substantially built, and to grow gradually into a staid agricultural community and a dignified county seat. Eldorado passed through a similar history for the same reasons. The mining canals of both became irrigation ditches, and their wasted slopes were given over to viticulture, while the neighbouring fields passed under adequate tillage.

Many towns rose quickly from camp to trade centre under changing conditions, and as quickly melted to a rubbish-heap when the miners of the locality heard of richer finds elsewhere. Everything in the construction of towns partook of the precarious and unstable. A thousand incalculable incidents, usually styled luck, but growing out of the distribution of the precious metals, were constantly lifting up one town and pulling down another, inflating this district and impoverishing that. As the mining industry continues to increase, wood structures replace the tents, brick or better wood replaces the first wood, and the new-born city thrives; then the gold fails, and in a week the town of a thousand people is deserted, perhaps never to be again rehabilitated with activity, perhaps to lie dormant a season, and then, because new deposits are found, come forth as some other style of mining centre, or, because irrigation possibilities and soil resources have been recognised, as an agricultural settlement. Hence it is that wrecked towns as well as camps are exceedingly common in most of the leading mining States; and, further, it is true that similar conditions are producing similar results to-day. Millions invested in towns, ditches, and appliances, now in ruins, have been wasted because the actual distribution of the ore was not known, or because the proper processes for its extraction had not been found. No accurate estimate of this loss can be made.

Monterey, California, founded in the year 1770 as a Spanish mission and garrison, was the Spanish capital of the territory until 1847, and the American capital from then until after the constitutional convention of 1849. It was deserted for the mines in 1848, in spite of the dignity recently acquired, even as was San Francisco, and both commercial San Francisco and governmental Monterey were temporarily eclipsed.[1] Taylor[2] predicted a great future for the town, even though its governmental supremacy vanished with the removal of the capital to San José.

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[1] H. H. Bancroft, *History of California*, 1884, vol. vi. pp. 63, 64.

[2] B. Taylor, *Eldorado*, 1857, pp. 140, 141.

But its early start availed nothing; for it was effectively cut off form the influence of gold and silver by the Coast range, and no railroad has yet reached it through the mountains, although it has railroad connections and outlet both north and south between mountains and coast. In 1883 it had fourteen hundred people and in 1890 sixteen hundred. It is now no more than a little quiet residence town for a few retired men.

Influence on Place-names.—Names of towns all through the mining States bear the marks of their origin as mining camps. Instead of ville, city, burg, or ton, the affixes are camp, flat, bar, beach, bank, gulch, etc. Sometimes the name has the ordinary affix and a radical gold-determined, or it contains some term for gold or silver, or consists of something strongly smacking of camp-life. The following illustrations were selected from small-scale maps in a school atlas and in *Britannica*. It may be that one or two of these names were given for other reasons than the influence of the precious metals, but most of them are certainly gold-derived.

Angel's Camp	Goldburg	Silverton
Happy Camp	Gold Hill	Silver City
Camp Grant	Golden	Silver King
Chinese Camp	Gold Creek	Silver Bow
Moor's Flat	Richfield	Silver Plume
Dutch Flat	Ophir	Argenta
Fresno Flat	Eldorado	Chloride
Oak Bar	Oro Fino	Telluride
Rocky Bar	Oro Blanco	Eureka
Washington Gulch	Oroville	Powderville
Brown's Cañyon	Placerville	Troublesome
Cut Bank	Quartz	Bonanza
Gold Beach	Enterprise	Presto
Goldendale	Silver	Fairplay

Scores of stations, cross-roads, and other minor places proclaim their ancestry in their patronymics. Not only do towns bear the royal colouring, but many words in our language have been coined for special mining terms, or incorporated into the language from some other tongue, or given special technical meanings, as results of the gold- and silver-mining industry. Pay-dirt, prospecting, hydraulicking, and pay-gravel illustrate the first type: placer, bonanza, tye, and buddle the second: and tom, ledge, show, colour, etc., the third.

Paper Towns.—City-building and town-booming by oily-tongued agents early became a business, and in the speculative atmosphere of the West the business grew. California suffered most in the earlier days because she was the pioneer as well as the greatest gold producer. Bancroft says this State had probably more paper towns than any equal area in the West.[1] The city-building craze possessed men most strongly in 1849 and 1850, after which the symptoms abated to sporadic cases with occasional epidemics, as in 1863. "Corner lot" speculations were

[1] H. H. Bancroft, *History of California*, 1884, vol. vi. p. 443.

common. Cross-roads, ferries, and even river-landings had their promoters who predicted their future greatness. Examples may be found in such paper fabrics as Linda, Kearney, Eliza, Featherton, and others from California's roll. Idaho has suffered much in recent years from town-lot agents, as well as from spurious mining companies and unscrupulous stockbrokers.

Influence on Settlement in General.—The discussion of towns and cities must not claim all our attention in the consideration of the settlement of the West, as influenced by the precious metals. The chief business prior to 1849 all through these Western States was trapping and fur-trading, a business whose success and permanence depended on the suppression of any tendency toward fixed settlements for the development of agriculture and grazing. Hence, the occupation of these States cannot be attributed to the influence of that industry. Following it, and discouraging it to a considerable extent, the mining industry spread over the whole western section, more actively and more permanently in some places than in others. Thus, mining the precious metals became the pioneer industry throughout much of the West. Because its tendency was to call into being, as associates and feeders, agriculture, grazing, lumbering, manufacturing, commerce, and government, this development of mining resulted in settlement for other subsequent industries. The history of settlement and the development of industries in most of the Western States is largely a history of their mining industry.[1]

Colorado and California have had the most rapid development, and have been in the aggregate the heaviest producers. Nevada is the third in total output, but her backward condition is due to her lack of other possible resources. It is a marvel that even her mining industry has been able to reach such dimensions against such odds. What would her development have been had there been no gold- and silver-mining to nurse and coerce other industries? And of the other States, so far as settlement is concerned, probably Washington, Oregon, and Utah have been least affected; the two former, because of moderate values and limited development of the ores, while settlement for other industries has responded to the general call of progress and been stimulated by the influence of mining in neighbouring States; the latter, because religious beliefs suppressed mining for a long time but encouraged settlement for other occupations, and these were greatly aided by mining in other States.

In two ways the influence on settlement is evident. Tens of thousands of men went West to mine the precious metals, but many of them soon decided to withdraw, or were forced by hard luck, lack of capital, or ill-health, into other occupations. While a large number returned to the East, thousands remained on the agricultural or grazing lands or entered the forest as lumbermen, while still others entered shops, warehouses, stores, offices, etc., aiding the general settlement and development of the country by their presence and work. Further, the

[1] R. P. Porter, *The West from the Census of* 1880, 1882, p. 372.

great output of gold advertised the West both in the East and abroad. In connection with gold stories went its news of soils, crops, forest, and climate; and *bonâ fide* settlers, who never intended to mine at all, have gone into all parts of the West. Not only has gold- and silver-mining been a pioneer industry throughout the Western mountain States, but it has been a fundamental force in opening up to settlement as much of the vast area as it is desirable to settle.

Effects on the Foreign Population.—Little need be said of the special influence on the foreign population of the West. According to the Twelfth Census, foreigners are congested about Butte, Montana, in several places in California, both in the valley and on the mountain slopes, and in scattered patches over both agricultural and mining lands. It seems that with the Americans came also others in response to the drawing power of gold; but probably in no greater proportion than they came to engage in other occupations open in a new country. Certainly gold- and silver-mines have been no more effective in settling foreigners in their vicinity than have coal-mines, iron and cotton factories. Certain local phases and one general result of foreign settlement in the West must be noted. A large influx of Spanish-Mexicans occurred in the early California days, but it was always second to the pure American immigration even then. The Sonorans scattered all along the Sierra valleys, but were not allowed to remain because of their general indolent, unruly character, and their special tendency to thievishness. Their expulsion began well north, and they settled again farther south; then, again becoming a nuisance, they were sent home in great numbers. Mexicans certainly would have been more permanent settlers in California if the treasure had never been found, and no Americans brought thither to oppose them. A second local effect of the influence of gold on foreigners is the gift to the Pacific States, and notably to California, of thousands of Chinese. Many of these cheap labourers came exclusively to dig gold. Others came to engage in some of the lucrative subsidiary occupations, such as cooking, laundry work, and farming. Thousands are engaged in agriculture, horticulture, fishing, etc. They were not usually allowed in the mines or gravels with the Americans, so they took up abandoned claims, and even to the present thousands of Chinese are laying up money on the "worn-out" claims.[1] An attempt has been made to find out if there were any notable responses to California's call from gold- and silver-mining regions in other parts of the world, but without any result. Not one, but all occupations sent settlers to the mining regions.

The general effects over the entire area of the mining States, of their occupation upon an exceedingly mixed and varied population, drawn from all classes, creeds, and nationalities, are apparent. What Jordan[2] said of California as a consequence of this cosmopolitan character applies, though often with less force, to most of the mountain States. "It is the most cosmopolitan of all the States of the Union, and such it will

[1] H. H. Bancroft, *History of California*, 1884, vol. vii. p. 649.
[2] *Atlantic Monthly*, 1898.

remain. Whatever the fates may bring, the people will be tolerant, hopeful, and adequate, sure of themselves, masters of the present, fearless of the future." The percentage of the foreign element is no higher than in other portions of the United States, or in other industries, but the variety in any locality is greater, and no one element predominates.

THE TOPOGRAPHY, CLIMATE, AND VEGETATION OF THE GOLD COAST.[1]

(With Map.)

Mr. Thompson, the Conservator of Forests, Southern Nigeria, has drawn up a very elaborate Report on the forests of the Gold Coast, which is in reality a detailed study of African tropical vegetation. We summarise below the parts of the Report which directly interest the geographer.

The Gold Coast with its two administrative divisions or dependencies, Ashanti and the Northern Territories, comprises an area of something like 82,000 square miles. It is situated on the coast of Guinea, between the French possession of the Ivory Coast and the German Colony and Protectorate of Togoland, with the frontiers of which its western and eastern boundaries coincide. It has a sea-board extending from 3° west longitude to 1° east longitude, and is bounded on the north by the 11th parallel of north latitude and by the French Sudan and Dahomey. The greatest length from north to south is about 450 miles. It is thus wholly situated within the northern tropic.

The chief rivers draining this extensive tract of country are—

1. *The Volta*, with its two large feeders, the Black and White Voltas —the former of which rises in the Mina Mountains of the Western Sudan, and the latter some hundred miles due north of the important town of Wagadugu in the French Sudan. The Black Volta from the 11° north parallel as far south as about 8° 40′ north forms the boundary between British possessions and those of the French.

The Black Volta is a fine river, but unfortunately the channel is much obstructed in places with rapids. The White Volta drains a considerable portion of the Northern Territories. The most important tributaries on the right bank of the main or Black Volta are, within British territory, the Tain, Pra, Sene, Sumi, and Afram Rivers, all of which, except the last, drain the northern portions of Ashanti.

2. *The Tano River.*—This rises in north-western Ashanti, and, after flowing in a more or less north and south direction for nearly the whole of its course, empties itself into the Tendo Lagoon on the extreme south-western border of the Colony, close to the coast town of Half Assini. It is also obstructed by rapids, but they are said to be not very formidable, and the obstructions causing them are capable of being removed. The

[1] Colonial Reports: Miscellaneous. Cd. 4993. *Gold Coast: Report on Forests.* By Mr. H. N. Thompson, 1910. Price 1s. 1d.

Tano River drains the best forests of Ashanti and the Colony—a wooded area of several thousand square miles.

3. *The Pra River.*—Rising in the high hills of Okwawu and Eastern Akim, this river flows for the greater portion of its journey in a south-westerly direction: at Sarmang it turns to the south and flows into the sea close to the town of Shama. It drains an extremely hilly tract of country, and is, like the others, rendered unnavigable by the presence of rapids. The most important feeders on its right bank are the Anum River, which drains the country to the east of the sacred lake, and the Offin with its tributary the Adra. They both drain the southern and south-western portions of Ashanti. On the left bank it is joined by two important feeders, the Inwi and the Birrim, the latter of which is much the larger of the two, and drains one of the best cocoa-growing districts.

4. *The Ankobra River.*—This stream rises in the extreme northern portion of Upper Denkira, close to the mining centre of Bibiani, and is confined for the whole length of its course to the limits of the Colony. It flows almost due north and south through a very rich mining and timber country, and falls into the sea close to Axim.

Other less important rivers are the Nakwa, in the Salt Pond district, the Amaso in Winneba, and the Densu in the Accra district. These rise in the Atikwa and Aquapim hills, and all of them flow in a general north to south direction. In the neighbourhood of the sea they flow through open country covered with low scrub or savannah forest. In the eastern portion of Ashanti a small tract of densely-wooded country is drained by the Bia River, a tributary of the Komoe, which is the most important water-way of the French Ivory Coast.

Generally speaking, the country along the sea-board is undulating in character, especially to the east of Winneba, where extensive plains exist between the coast and the well-marked hill ranges of the interior, which approach on an average to within fifteen to twenty miles of the sea-shore. Westwards of the above-mentioned town the undulations are much more pronounced and give rise to low hills with abrupt slopes facing the sea. The coast-line is on the whole bold and well defined, and the long stretches of low-lying mangrove swamps, so characteristic of the Southern Nigerian coast, are here a very subordinate feature of the country.

As one recedes from the coast-line northwards the land becomes very hilly, well wooded, and rich in perennial streams, and these characters are maintained till the central plateau of Northern Ashanti is reached, when the dense forests gradually give way to the open savannah formations, in which the water-supply during the dry season is poor, and the contours of the country again assume an undulating character. These upland plains are, however, dominated here and there by well-marked rocky hills that sometimes reach an altitude of over 1600 feet. The plateau is interrupted by the lower valley of the Black Volta River to the north, but reappears a short distance inland from the left bank of that river, and gradually increasing in height culminates in the tableland on which Gambaga is situated. It must attain an altitude of close on 2000 feet in that province.

The approach to the Ashanti plateau from the east is much more

gradual, as the valley of the main Volta leads up to it from that direction. This valley is nevertheless very much contracted in places where prominent hill ranges, running in a north-easterly direction, are broken through by it in the vicinity of the village of Mem; beyond this gorge the country opens out on to the Afram plains, which gradually merge into the North Ashanti plateau. The Volta River is practically the only drainer of the latter, and the plateau is lowest in the north-east corner of Ashanti.

The most pronounced ranges of hills are—

(1) The water-parting between the Offin River and its tributary the Adra. To the north of N'Kwanta it culminates in a range over 1600 feet in altitude.

(2) The divide between the Tano River and the Ankobra; this also reaches a similar altitude.

(3) The Oboase hills, forming the divide between the Offin and the Jim Rivers. They culminate in a peak that is close on 1800 feet above sea-level.

(4) The Dampia and Moinsin ranges, forming the divide between the Jim and Anum Rivers, both of them tributaries of the Pra.

(5) The Bompata hills, forming the water-parting between the main Pra and its feeder the Awere.

(6) The Obo-Abetifi group, forming the sources of the Pra and Afram Rivers. The highest peak reaches an altitude of 2200 feet above the sea. This is the most prominent block of hills in the country, and it assumes the formation of an irregular plateau with steep escarpments on all sides, except to the north, where the descent to the Afram plains is in comparison rather gradual. The climate of these hills is delightfully bracing, and from the higher peaks magnificent views of the vast undulating plains to the north can be obtained.

(7) The Bogora range, forming the sources of the Birrim and Ahurum Rivers. It is a prominent range, having an average altitude of about 1800 feet.

(8) The Kyebi hills, on which the Densu River rises. They reach an altitude of close on 2000 feet.

(9) The Akwapem and Akropong hills, about twenty-five miles to the north of Accra. They culminate in peaks about 1600 feet above sea-level.

(10) The Krobo hills. These consist of some extraordinarily steep, isolated hills, situated to the north-east of Aburi, in the neighbourhood of Akuse.

(11) In addition to the above, there is a very prominent range of rocky hills on the north-western border of Ashanti in the Banda district, and some bold escarpments between N'Koranza and Chichewere and the neighbourhood of Mampon.

The climate of the Gold Coast and its dependencies, so far as rainfall and the relative humidity of the air are concerned—and these two factors have the most influence on plant growth in the Tropics—can be ascertained from the data given below, which have been compiled from

statistics given in the Gold Coast annual reports for the five years, 1903 to 1907. Those for the seaport town of Sekondi are based on the figures for three years only—namely, 1905 to 1907.

Average Rainfall and Relative Humidity of the Air for the Five Years, 1903 *to* 1907.

Station.		Rainfall.	Relative Humidity.
Sea-coast stations,	Axim,	80·02	87·61
	Sekondi,	41·23	64·33
	Cape Coast,	34·49	84·18
	Accra,	21·52*	79·46
	Kwitta,	19·61	79·96
Inland stations,	Aburi,	40·72	86·05
	Kumasi,	52·77	86·27
	Gambaga,	48·21	60·41

* The mean of twenty years' observations is 27·35 inches.

These figures show that the rainfall along the coast-line decreases as one proceeds eastwards from Axim, where it is 80 inches, to Kwitta, on the extreme eastern extremity of the Colony, where it is only 19·61 inches. That of Kumasi, which is situated in the northern half of the forest region, is 52·77, and of Gambaga, the most inland station, close on the 11th parallel of north latitude, 48·21 inches. Aburi, being a hill station, shows a climate characteristic of such localities, in its relatively high degree of humidity, which is 86·05 for a rainfall of only 40·72 inches, against 87·61 for Axim, where the rainfall is as high as 80 inches.

Gambaga shows the extremes of a continental tropical climate, and has the lowest relative humidity, viz. 60·41, of those recorded. The coastal stations, on account of their proximity to the sea, possess a higher relative humidity than the recorded rainfalls would otherwise lead one to anticipate.

The maximum shade temperatures range from 91°·56 F. at Gambaga to 81° F. at Aburi, and the minimum shade temperatures from 70° F. at Kumasi and Axim to 76° F. at Kwitta, and 75° F. at Cape Coast Castle. These temperatures are well within the normal range for tropical plants. The seasons of the year may be divided into the following groups, viz. :—

(*a*) The wet season proper, extending from about the middle of May to the end of July ;

(*b*) The small rains, extending from the beginning of September to the middle of November ;

(*c*) The dry season proper, extending from the middle of November to the end of February ;

(*d*) The small dry season, which consists of a break in the rains and is practically confined to the month of August ; and

(*e*) The tornado season, from the beginning of March to the com-

mencement of the heavy rains in May. This is an intermediate season, in which, though thunder storms and showers of rain are pretty frequent, yet the number of dry days is much in excess of those on which rain falls.

The limits given above are, of course, only approximate, and they are sometimes widely departed from, but, on the whole, they indicate with fair accuracy the sequence and character of the seasons.

During the months of December, January, and February, the Harmattan blows from the north and north-east at pretty frequent intervals, and sometimes lasts for a great number of days in succession. It is accompanied by a dust haze consisting of fine particles of quartz, diatoms, etc., and its contact with the hot, moist air near the coast often brings about the fogs and mists so prevalent at that season of the year. The Harmattan is generally supposed to blow across the sandy wastes of the Sudan on its way to the sea, and to carry with it the finer particles of sand from those regions. Whatever its origin, it has a very marked effect on the vegetation, and, to a large extent, determines the distribution of the different types. As one proceeds inland and northwards from the coast, the Harmattan is found to be more pronounced and to last for much longer intervals at a stretch, till in the interior beyond the 10th parallel of north latitude it is the prevalent breeze at that season of the year. Rainfall has, of course, the most influence on the vegetation, but at the same time the action is much modified by desiccating winds of the nature described above. When these are practically a constant feature of the season for several months at a stretch, the country rapidly dries up, though the actual total rainfall may have been abundant enough to support luxuriant vegetation but for the prolonged dry weather brought about by such winds. Gambaga is a case in point; the mean annual rainfall, as far as available data go, is 48·21 inches, which is only 4·56 inches less than that of Kumasi, a station situated within the evergreen forest belt; but the difference between the mean relative humidity of the air in the two places is very great indeed—60·41 per cent. in the former place, and 86·27 per cent. in the latter. It is this reduced humidity, brought about by prolonged spells of dry weather, that accounts to a large extent for the very pronounced difference in the vegetation of the two localities.

There is but little doubt that the presence of extensive forests in the vicinity of Gambaga would considerably temper and diminish the drying action of the Harmattan winds and make the country moister than it is, though it may result in no very marked improvement in the rainfall, whilst conversely, the persistent destruction of the forests for a good distance round Kumasi would result in the soil becoming dryer, in the water-supply being reduced, in the drying effect of the Harmattan being intensified, and in a change of the type of vegetation.

The most prevalent soil of the country is a red sandy loam, coloured by the presence in it of ferric oxide. The amount of sand in the clay varies in different localities, but this has no marked effect on the vegetation within the maritime forest zone and the heavy rainfall associated with

it. Outcrops of laterite are frequently met with in the same region, but the edaphic influences due to such changes in the soil are completely overshadowed by the very much more powerful action exercised on the vegetation by the copious rainfall.

Metamorphic rocks of a granitoid and schistose character, together with frequent outcrops of sandstone and quartz, form the chief materials composing the more important hill ranges; in the hinterland, where the rainfall is small or a pronounced dry season occurs, the vegetation is much modified by the presence or absence of the different soils due to the weathering of the above rocks. Here, again, laterite reappears as extensive outcrops of a hard, stony, porous character, containing vitreous or cellular concretions of ferric oxide or ferric hydrate, and exercises a profound influence on the plant growth. Its presence is always associated with poor, gnarled, stunted vegetation, exhibiting a very marked xerophilous character.

The sandy soil along the sea-coast in the vicinity of Accra, for a considerable distance inland from the shore, is much impregnated with salt, which is blown up with the spray and carried a good way in by the strong sea breezes so prevalent in that locality. The vegetation about here, especially that of a shrubby or herbaceous character, has acquired the halophytic habit.

The chief plant associations which cover the surface are the following:—The rain or moist tropical evergreen forests; the fresh-water swamp forests; the monsoon or mixed deciduous forests; the savannah forests; the savannahs.

The *tropical rain forests* of the Gold Coast and Southern Nigeria contain trees of very lofty growth scattered amongst those of more moderate dimensions. The outline of the top of the forest vegetation is very irregular in shape, and is frequently interrupted by the crowns of these giants.

As a rule, the trees in the rain forests are connected one with another by a regular network of climbers. Epiphytes are crowded all over the stems and larger branches. Several tiers of vegetation, corresponding to the heights attained by the component species, are to be met with, and under all a deep gloomy shade prevails, relieved only occasionally by spots of sunshine on clearings formed by the downfall of some forest giant. The air is saturated with moisture, and is, as a rule, remarkably still; conditions very favourable to luxuriant forest growth throughout the area inhabited by the rain forests. The dry season is of short duration, is frequently interrupted by showers of rain, and the Harmattan winds are feebly developed.

The virgin forests of this type are as a rule comparatively free of *tangled* undergrowth. The latter seems to be a secondary development brought about by the destruction of the vegetation for farming purposes; in the older forests the undergrowth is straight and not very dense, so that it is possible to walk about in it without having to continually use the knife to clear a way through the forest.

Quite a large proportion of the trees found in this type have a very

wide range, and are to be met with over extensive tracts of country that possess a climate with a much smaller rainfall; in such areas, however, owing to the greater humidity brought about by the hilly nature of the country and the existence of deep sheltered valleys that are frequently occupied by perennial streams and swampy soil, the trees in question are still able to thrive, but with many of them the departure in habitat from the continually moist environment of the rain forest is associated with a more pronounced xerophilous habit and a greater periodical defoliation. Some species remain evergreen throughout their range.

The rain forest is rich in useful species, including timber trees, rubber-yielding plants, and also forms yielding dyes, fibres, oils, and fats, notably the oil-palm.

The *fresh-water swamp forests* are composed of plants that have adapted themselves to growth in a permanently wet soil. They have much the appearance of plants inhabiting the rain forest, but are not so crowded. The formation is a comparatively open one. The swamps occur chiefly in the vicinity of the larger rivers, and are often caused by their overflow. They occur also in hilly country along some of the deeper valleys.

The useful species include the Raphia palm, which yields the piassava fibre of commerce, also some timber and oil-yielding trees.

The *monsoon or mixed deciduous forests* are very rich in plants of economic importance. They are inhabited by both Tropophilous and Hygrophilous plants in varying proportions, according to local fluctuations in the rainfall and edaphic conditions. The forests, on the whole, are greener than the typical monsoon forests of India, Burma, and Siam, and contain fewer species with the Tropophilous habit; nevertheless, owing to the complete, or nearly complete, defoliation of the latter during the dry season, the West African type is easily distinguished at that season of the year from the true rain or moist tropical evergreen forests. Forests exactly similar in habit to the mixed deciduous forests of Eastern Asia are very rarely met with, and then only as insignificant belts, in tropical West Africa.

The Indian formation is more closely approached, on the other hand, by the *denser stocked savannah forests* of the coast, but here the grasses form a more prominent feature of the formation than occurs in the case of the Indian type. Generally speaking, in tropical West Africa the transition between the rain forests and the savannah forests is more abrupt than in Asia. This is probably accounted for by the prolonged dry season experienced over extensive areas in the latter continent, whereas on the Gold Coast and in Southern Nigeria, up to the 8° parallel of north latitude at all events, that season is tempered by frequent showers of rain during the tornado months, which coincide with the vegetative periods of the grasses, and thus favours them at the expense of forest growth. In other words, owing to this feature of the climate, as soon as an area becomes, from the reduction in the annual rainfall, unsuitable for *luxuriant* forest growth, it is appropriated by the grasses instead of by the intermediate stage represented by the typical monsoon forests.

A large number of the evergreens found in the mixed deciduous forests of the Gold Coast belong to identically the same species as those met with in the rain forest. They are, however, generally found growing in the moist soils close to the banks of streams, or in sheltered ravines, and on the northern aspects of the hills, whilst the deciduous-leafed species occupy mainly the drier soils farther back from the streams and the exposed southern and western aspects of the hills. The mixture of Tropophilous with Hygrophilous species is more one of *groups* of each type than of a true intermingling of individual trees of each kind.

It may be that the more pronounced, dry Harmattan winds met with in the higher latitudes (from 7° 30′ N. and upwards) during the winter months (November to February), which is the resting season of the grasses (a period when they are absolutely indifferent to drought), and the prevalence of fierce fires at the same time, severely handicaps the woodland formations in their struggle with the grasses.

A peculiarity of the West African monsoon forests is the frequent occurrence in them of small but pure communities of herbaceous plants belonging to the order *Scitamineæ*. Such patches are composed of species of *Amomum*, *Costus*, and *Phrynium*, the last of which supplies the natives with leaves for thatching purposes, and the first-mentioned genus a species that yields "the grains of Paradise." Each such patch is pure, and consists practically of one species.

The mixed deciduous forests of the Gold Coast and Ashanti, besides containing to a greater or less extent most of the valuable species whose headquarters are the rain forests, include also several mahoganies, ebony, satinwood, and other timbers, many rubber vines, fibre and dye plants, etc.

The *savannah forests* constitute a park-like formation, rich in terrestrial herbs and more particularly in grasses. The tree growth is represented by arboreal tropophytes and evergreen xerophytes, but the latter are not numerous, and form an insignificant proportion of the vegetation. The density of stock, so far as the trees are concerned, varies in accordance with the nature of the soil and its telluric properties. On stiff laterite formations the trees are dwarfed, gnarled, and widely scattered, whilst alluvial hollows and the narrower valleys are much more densely stocked, but never to the extent seen in the monsoon or mixed deciduous forests. Where the supply of telluric moisture is copious, however, fringing forests of great density occupy the soil, and they frequently contain species characteristic of the monsoon and even of the rain forests. The outcrops of laterite and metamorphic rocks so frequently met with in Northern Ashanti and in the hinterland of Southern Nigeria are usually encircled by a ring of such fringing vegetation, the moisture in the soil bordering the outcrops of rock being supplied from the drainage off the latter. A peculiarity of the country occupied by the savannah forests is that during the rainy season extensive areas are under water for very long periods at a stretch; but they rapidly dry up at the end of the rains, and the soil is then thoroughly turned over by the action of the earthworms. Literally hundreds of thousands of the latter must operate within the space of a few acres, for the surface of the soil is

often for many square miles in succession absolutely covered with their castings. These, when dry and hard, render the act of walking over them a very fatiguing operation.

In such areas an impermeable pan of hard clay, or sometimes of laterite rocks, exists close to the surface of the soil, and renders the latter swampy.

Another feature of the savannah forests is the annual prevalence in them, early in the dry season, of fierce grass fires that do an incalculable amount of harm to tree growth and keep it in check. The fires are generally most intense and destructive on the dried-up swampy areas, which are, as a rule, covered with tall, coarse grasses belonging to the family *Paniceæ*.

The average height of the tree vegetation is much less than that characteristic of the monsoon, rain, and fringing forests, but occasionally gigantic specimens of the Odoum (*Chlorophora excelsa*), the silk cotton tree (*Eriodendron anfractuosum*), and the baobab (*Adansonia digitata*) are to be met with in the savannah forests.

The savannah forests, together with the fringing forests, are fairly rich in useful plants, and since they cover very extensive areas in the hinterland of the British West African possessions, they are by no means to be despised. Among other useful species, rubber vines and the Shea butter tree occur.

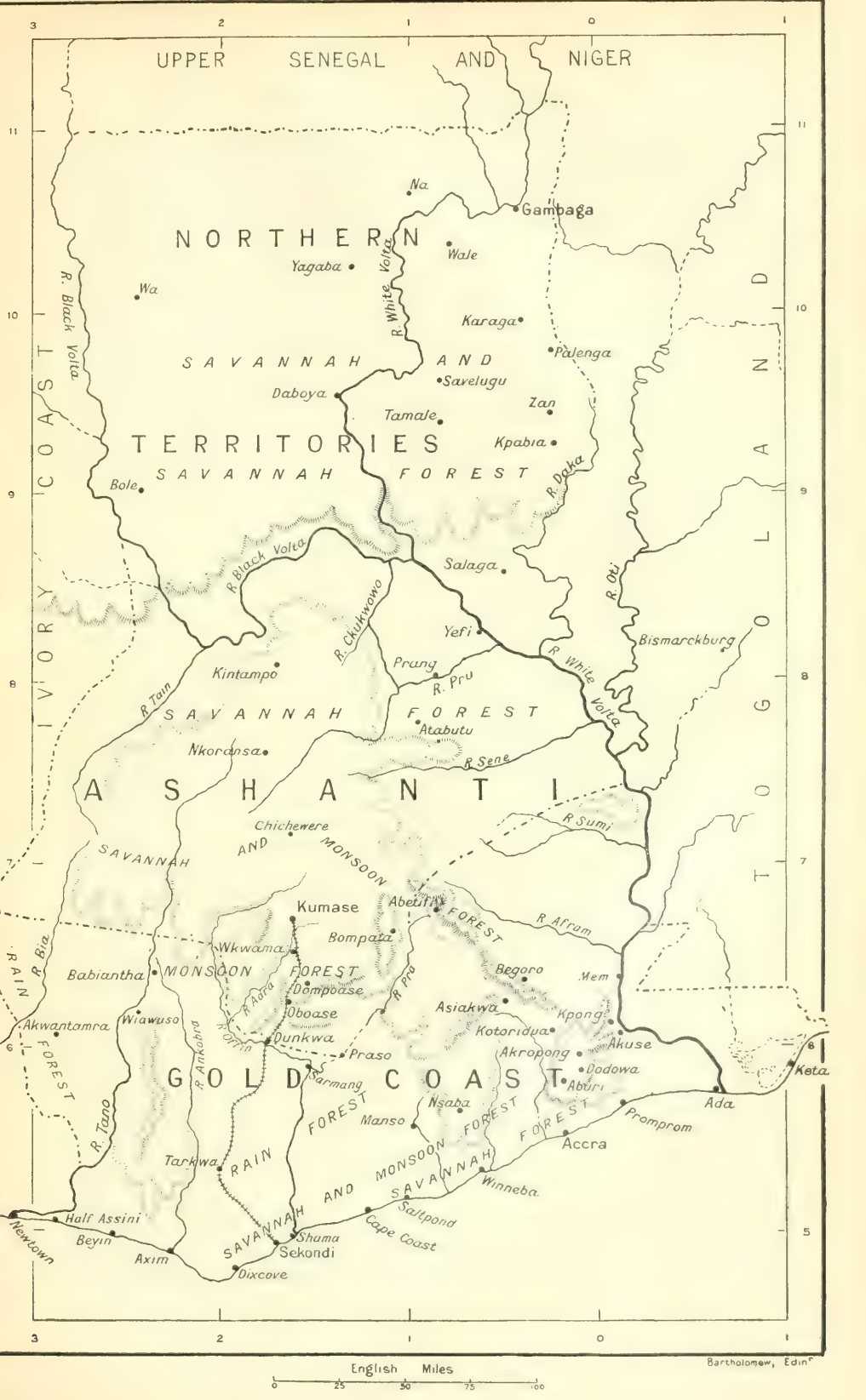
Savannahs consist of formations in which trees are practically absent and the dominant growth is represented by the grasses. They occur in West Africa merely as local variants here and there of the savannah forests, and are not extensive.

Thorn forests are also poorly represented, and only occur in small patches, such as near Accra, and again in the Banda country of north-western Ashanti, within the savannah forest districts.

As a general rule, the destruction of the vegetation by the natives for agricultural purposes results in the following conversions, which invariably end in a drier type of vegetation succeeding the one removed. The stages are—rain forest is converted into monsoon forest; monsoon forest into savannah forest; savannah forest into pure savannah.

Only a general idea can be given of the distribution of these various types of forest within the limits of the Gold Coast and Ashanti. Accurate data for the preparation of a proper map would take years to collect; at present only rough approximations are possible.

The *rain or moist evergreen tropical forests* are in their typical form restricted on the coast-line to the extreme south-west corner of the Colony in the neighbourhood of Axim. From there they extend northwards (with one marked break) along the valleys of the Tano, Ankobra, and Bia Rivers, through Wassaw, upper Denkira, and Sefwi, to just north of the 7th parallel of north latitude. They have a tendency to hug the western frontier during the greater portion of their range, and are interrupted between Asankagwa and Wiawuso by a broad belt of vegetation that possesses a drier strain, and stretches across the country from the Tano River to the railway between the station of Imbrahim and a point a few miles south of Oboase. An extensive branch of the


UPPER SENEGAL AND NIGER
NORTHERN
TERRITORIES
SAVANNAH FOREST
SAVANNAH AND SAVANNAH FOREST
ASHANTI
GOLD COAST
SAVANNAH AND RAIN FOREST
RAIN FOREST
SAVANNAH AND MONSOON FOREST
MONSOON FOREST
IVORY COAST
TOGOLAND
Na
Gambaga
Wale
Yagaba
Wa
R. White Volta
R. Black Volta
Karaga
Palenga
Savelugu
Daboya
Zan
Tamale
Kpabia
Bole
R. Daka
Salaga
R. Oti
R. Chukwowo
Yefi
Bismarckburg
Kintampo
Prang
R. Pru
R. Tain
Atabubu
Nkoransa
R. Sene
R. Sumi
Chichewere
Kumase
Abetifi
R. Afram
Bompata
Wkwama
Babiantha
Dompoase
R. Pra
Begoro
Mem
R. Bia
Oboase
Asiakwa
Kpong
Akwantamra
Wiawuso
R. Ankobra
R. Offin
Dunkwa
Kotoridua
Akuse
Praso
Akropong
Dodowa
Keta
Sarmang
Aburi
Ada
Nsaba
Manso
Promprom
R. Tano
Accra
Tarkwa
Winneba
Saltpond
Half Assini
Cape Coast
Beyin
Shama
Newtown
Axim
Sekondi
Dixcove
English Miles
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rain forest stretches from Axim in a north-easterly direction to Tarkwa, and the Pra River follows the valley of the latter a considerable distance inland, more especially along the upper course of its principal feeders the Anum and Birrim Rivers, and finally splits up into several detached belts occupying the deeper valleys of the Bompata, Abetifi-Obo, Bogora, and Kyebi hill systems.

The *savannah forests*, on the other hand, together with patches of scrub forest, are well represented along the opposite end of the coast-line, viz., on the south-east sea-board, whence they extend in a gradually decreasing (narrowing) belt as far west as Sekondi. To the north of Accra they follow the plain, and occupy the country up to the foot of the hills, and then sweeping round to the north—still keeping away from the more pronounced hill systems—follow the valley of the Volta River, and gradually broaden out till, at latitude 6° 30′ N. approximately, they rapidly increase in area, and bending away to the north-west, occupy the whole of the northern half of Ashanti (from east to west) right up to the Volta River, its large feeder, the Black Volta, and practically the whole of the Northern Territories on the opposite bank. They extend southwards as far as Puliamo on the west, and the neighbourhood of Chichewere in the centre (due north of Kumasi), and Abetifi farther eastwards.

The whole of the country not occupied by either the rain forests or the savannah forests is clothed with a rather green type of monsoon or mixed deciduous forest. The latter is, however, in the more hilly and well-watered localities frequently interrupted by narrow belts of evergreen (rain) forest. No very sharp lines of demarcation exist between these types, and they usually merge into each other very gradually.

An abrupt transition, however, exists just to the north of Abetifi, where one practically steps out from the moist forests of the hills to the savannah forests of the Afram plains. Belts of evergreen forest are, however, found along the immediate banks of the streams and in the moist depressions met with in this type of country. Extensive outcrops of laterite and schistose rocks are found scattered about the plains, and on them the vegetation is of the most scrubby and dwarfed character. The soil formed by the weathering of these rocks is nevertheless fairly rich, and supports good tree growth wherever it is moist and has accumulated to a sufficient depth. These rich patches of soil are usually met with just below the lower level of the "strike" of the outcrops, whilst narrower deposits border the channels of the streams.

Generally speaking, these rich patches of moist soil, covered as they are with evergreen forest, form the actual sources of the streams draining the plain. Very few of the former, if any, are perennial, but their courses can always be recognised, even at a distance, by the evergreen fringes of vegetation growing along their banks, the soil in such places being moist enough at the driest season of the year to support that type of vegetation.

From the foot of the Abetifi hills, as far north at least as the Sumin and Bunda Rivers, the country is undulating in character, with higher ridges separating the basins of the more important streams. Super-

imposed on these general features are numerous outcrops of laterite and schistose rocks, the latter of which often occur in the form of huge flat sheets (sometimes 200 to 300 yards in length, and 50 to 100 yards broad, and 10 to 20 feet high), arranged in successive terraces one above the other, like a gigantic staircase.

The sheets of rock often contain fairly large circular or oval depressions that are filled with rainwater during the tornado season, and form pools that last well into the dry season. Water-lilies and other aquatic plants occupy them, and the corrosive action of their roots helps to further enlarge the depressions till they sometimes reach the dimensions of quite a respectable sized pond. A few of them are said to contain water all the year round. The majority of the streams in this part of the country have their sources in these rocky pools, the overflow from which feeds the streams. For days after a shower of rain tiny rivulets continue to trickle off the sheets of rock down into the rich deposits of soil found at their bases, where moss and other evergreen vegetation cover the ground and help to hold the water in suspension like a sponge, and give it out gradually to the streams below. These patches of evergreen vegetation act as regulators of the water-supply, and explain why, in a tract of country having a poor rainfall, scanty evergreen vegetation and no marked hill features, such a large number of important streams are to be met with, some of which, at all events, contain pools of water even at the driest season of the year.

As far as it can be ascertained from data available, the distribution of the various types of vegetation follows closely that of the climates characteristic of such plant formation. The correspondence of the extremes of climate with the extreme forms of vegetation is quite evident enough, as can be seen in the case of the rain forests, the savannah forests, and the thorn scrub: but the agreement is not so pronounced in the case of the intermediate conditions corresponding to the monsoon or mixed deciduous forests. In the district occupied by the latter, alternations of narrow belts or small patches of rain forest with vegetation of a somewhat drier character, or with formations approximating closely to the typical monsoon forests, are frequently to be met with next door to each other, but this want of homogeneity is brought about first by the hilly nature of the country, and secondly by edaphic influences, which become more pronounced in regions where the atmospheric precipitations are not heavy enough to support the typical rain forests. The monsoon or mixed deciduous forests correspond to an unstable climate, the factors of which are such as not to decidedly favour either one or the other of the extreme forms of forest vegetation.

The mean annual value of the forest produce exported from the Gold Coast and Ashanti during the last twenty years amounts to £576,942, or considerably over half a million pounds sterling. There is no doubt that the trade in these products is capable of very considerable development, especially in the case of timber and palm oil.

With the opening up of the Tano and Pra Rivers to timber exploita-

tion, by the removal of the obstructions in those streams, the forests are quite capable of more than quadrupling the present output of timber. Similarly there are vast areas in the Waw-saw, Denkira, and Sefwi districts, as well as in Ashanti, which are very rich in the oil-palm, and are practically untouched at present. In fact, the inhabitants are often so indifferent to the value of the tree that they frequently tap it for palm wine.

SLEEPING SICKNESS IN UGANDA.[1]

This Report, which was presented to Parliament at the end of last year, gives a very interesting account of the fearful ravages caused by the disease of sleeping sickness in Uganda, and of the measures which have been adopted in dealing with it. Some parts of the story are already familiar, but it seems worth while to present a general summing-up of the matter in so far as it affects the geographer, for there can be no doubt of the geographical importance of the subject. As will be shown below, sleeping sickness has rendered large tracts of fertile land uninhabitable, and, apart from its direct effect in eliminating whole communities, has therefore also affected the distribution of man in Africa.

The exact region from which sleeping sickness was introduced into Uganda is a matter of some doubt, but it is believed to have come from the Congo basin, and then gradually to have spread up the western and northern shores of Lake Victoria Nyanza. Its nature was not at first recognised, and it was regarded as a contagious or infectious disease, which in default of any method of cure could only be met by the segregation of the sick. In the early part of 1903, Col. Sir David Bruce discovered the association of trypanosomes with the disease, and the part played by the tsetse fly in its dissemination.

This announcement indicated that Europeans could no longer consider themselves immune from infection, and caused much consternation. Tsetse flies abounded to such an extent along the whole of the lake shore, that any attempts at their wholesale destruction appeared to be hopeless. Colonel Bruce's view was strongly supported by the fact that the disease was almost everywhere confined to the localities infested by the fly, and there was every reason to believe that in cases found in places farther inland the disease had been contracted by the victims during visits to the lake shore. The fly-belt could be defined with considerable precision, and the area of danger was rarely found to exceed a distance of more than a mile or two from water.

It was soon ascertained that tsetse flies specially favoured places where there was abundant shade, at the edge of the water. It was suggested that the elimination of the conditions favoured by the flies might

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[1] *Report on the Measures adopted for the Suppression of Sleeping Sickness in Uganda.* By Sir H. Hesketh Bell. Colonial Reports: Miscellaneous. Cd. 4990. Price 5d.

result in driving them away, and experiments in that direction were carried out along the foreshore of Entebbe. The results were most satisfactory, and in a few months the European settlement was practically freed from tsetse flies.

Unfortunately the shore along the whole of the northern coast of Lake Victoria is bordered by a dense forest growth, and the cost of clearing is so great that operations on a very large scale appeared to be impracticable. In order to drive away the fly completely, it would not only be necessary to cut down the forest but also to remove all bush, and to keep the land perfectly clean. The resources at the disposal of the authorities only permitted of such work being done on a comparatively small scale, and during 1903 and 1904 it was restricted to the immediate vicinity of Entebbe.

Colonel Bruce's discovery seems, for a time, to have almost paralysed all efforts at repressing the spread of the disease among the natives. The people absolutely refused to leave the fly-infested localities on the lake shore, and displayed a remarkable fatalism. Buvu, the island selected for a segregation camp, was found, like all others of the Sesse group, to be swarming with tsetses, and all idea of carrying out the original scheme of segregation seems to have been abandoned. In the meantime the disease raged unchecked. By the end of 1903 the deaths numbered over 90,000, and the lake shores were fast becoming depopulated. Whole villages were completely exterminated, and great tracts in Busoga, which had formerly been famed for their high state of cultivation, relapsed into scrub and forest.

The natives declined to believe in the agency of the tsetse fly, and the sick, in all stages, being permitted to remain within the radius infested, provided an ever-increasing source of infection for the flies. Millions of tsetses thus became inoculated, and proceeded to transmit the disease to those who might still be unaffected.

Meantime the disease began to spread down the Nile, and the presence of the tsetse was reported as far down as Gondokoro, as well as on the shores of the lakes Kioga, Albert, and Edward. Within Uganda the mortality was terrible, as no cure for the disease is known, and every person affected necessarily dies. An extract from a Report written by Sir H. Hesketh Bell to the Earl of Elgin at the close of November 1906 will show the terrible condition of affairs then :—

"The natives have been almost completely wiped out everywhere along the lake shore, and in the islands the mortality has been even more appalling. Buvuma, for instance, which a few years ago was one of the most thickly populated and prosperous of all the islands, counted over 30,000 inhabitants. There are now barely 14,000. Some of the Sesse group have lost every soul ; while in others a few moribund natives, crawling about in the last stages of the disease, are all that are left to represent a once teeming population. It might have been expected that, even though the negroes showed inability to grasp the theory of the transmission of disease by the agency of insects, the undeniable deadliness of the countries immediately bordering on the lake shore would have induced them to flee from the stricken land and to have

sought in the healthier districts inland a refuge from the pestilence that was slaying them by thousands. An extraordinary fatalism, however, seems to have paralysed the natives, and while deploring the sadness of their fate they appear to have accepted death almost with apathy, and to have preferred to perish in their old surroundings rather than migrate to countries where the conditions of life might possibly be uncongenial."

From a study of the facts at this time, it had become clear that the disease is only transmitted by the tsetse fly, and only by these when they bite infected persons and thus become themselves infected by the trypanosome which they transmit to the healthy. In these circumstances two preventive measures to the further spread of the disease present themselves—either the destruction of the fly, or the removal of all infected persons from fly-infested areas, in the hope that with the lapse of time the infectivity of the flies would cease. As the enormous numbers of the flies made their extermination an apparently hopeless project, the second alternative was decided upon. Therefore the same Report which is quoted above contained the following recommendations:—

"I submit that, failing the discovery of a therapeutic cure, it is only by the complete removal of all sick persons from the fly-infested districts that we can arrest the spread and progress of the disease, and I recommend the transfer to fly-free areas of the whole remaining population of the districts in the immediate vicinity of the lake shore. I would, however, exempt from this decision those places, such as Entebbe, Jinja, and one or two other localities where, by the complete removal of vegetation on the border of the Nyanza, tsetse flies have been almost completely eliminated. Even in the case of those places, however, I propose to so regulate the location of the natives as to render them free from all risk." . . .

"After very careful consideration of the whole matter, and in consultation with my medical advisers, I now feel myself justified in recommending immediate action on the following lines:—

"(1) The removal of all infected persons to fly-free areas, and their treatment by medical officers in specially organised camps.

"(2) The temporary removal of all healthy persons from areas infested by flies that are presumably infected.

"(3) The elimination of flies, as far as possible, in all localities from which the population cannot be removed, and in all places through which travellers are obliged to pass.

"(4) Further investigations into the life-history of the tsetse, with a special view to the discovery of conditions that appear to be inimical to the fly.

"(5) The study of curative agencies."

The recommendations were approved and work was begun at once.

In the original scheme it was proposed that all persons suffering from sleeping sickness should, on removal from the lake shore, be compelled to go to one of the segregation camps, and that they should remain there until either death or a cure should terminate their sufferings. It was subsequently represented, however, that the forcible detention of the patients in the camps should not be insisted on. It was believed

that any measure of rigid restraint would make the camps very unpopular, and that there would be frequent escapes. It was therefore decided to rely upon the personal influence of the chiefs over their people, and to use moral suasion only in the efforts to induce the sick to go into the segregation camps.

The most important and vital point was the complete evacuation of the fly-infested regions, and so long as the people were prevented from coming into contact with the tsetse fly it did not seem to matter much where they made their new homes.

It was estimated that, at the end of 1906, over 100,000 souls were still living within constant reach of the tsetse flies. Of these about 30,000 inhabited the islands in the Victoria Nyanza, while the remainder were occupying homesteads and villages either on the immediate lake shore, or on the banks of the Nile and of other fly-infested rivers. It was determined to deal first with the people who lived within the borders of the Kingdom of Buganda and in the Province of Busoga.

It was an immense relief to the Administration to find that the process of eviction from the interdicted zone promised to give far less trouble than might have been expected. Each chief who possessed estates or authority in the lands that lay within two miles of the lake shore received orders to see that the locality was completely evacuated by a given date. In most cases six months was considered adequate notice, and the peasants were urged to commence as soon as possible the building of their new homes. The chiefs and other landlords, finding that their tenants were not to be hurriedly driven off their estates, and that time would be given to them to locate their people on other lands which they possessed in fly-free areas, seem to have cheerfully accepted the situation, and though here and there a few of the peasants evinced a marked reluctance to move, no serious opposition to the orders of the Government was anywhere encountered.

In accordance with the recommendations made in the despatch above quoted, a small sum—something between 4s. and 6s., according to the number of huts and the extent of the farm—was paid to the head of each evicted family. These doles seem to have been thankfully received, and there is no doubt that the outlay under this head was money well spent, and that it greatly facilitated the peaceful acceptance of the whole scheme.

At the expiration of the period of grace, all who had not previously evacuated their holdings were ordered away. Their huts were burnt and their banana plantations were cut to the ground. Only the seriousness of the situation could have warranted such drastic measures. When it is considered that most of the farms and homesteads from which all these unfortunate natives were thus arbitrarily evicted had been the homes of their forebears for generations, says the Report, the remarkable state of discipline under which these people have existed is realised, and the extraordinary influence which their headmen still exercise over them. The chiefs, whose opposition to the wishes of the Government might, perhaps, have proved almost insuperable, loyally helped the Administration.

By the end of 1907 it was reported that the whole of the prohibited zone in the Kingdom of Buganda, stretching from the German boundary on the west to the Ripon Falls on the north-east coast of Lake Victoria, was completely evacuated. The depopulation of the Busoga shore had not been so effectively dealt with, and several thousands in that locality still remained to be moved. Good progress was, however, being made.

Buvuma and the Sesse Islands, in Lake Victoria, presented a problem which seemed hopeless. Professor Koch had expressed the opinion that nine-tenths of the natives who were living in the archipelago seemed to be already infected, and that, failing the discovery of a therapeutic cure, all would die. The people of Buvuma and of the Sesse group, though subjects of the King of Buganda, appear to have always kept themselves much apart from the inhabitants of the mainland, and it was believed that a serious rising would follow any attempt to force them to leave their island homes. It was determined, therefore, to concentrate attention on the people of the mainland, and to limit action as regards the islands to a rigid system of quarantine. The natives of Sesse and Buvuma were forbidden to approach the mainland, save at a few authorised landing-places. These places had been rendered fly-free by the complete removal of all forest-growth and bush in their immediate vicinity. They were railed in by fences, and no islander was permitted to go beyond those limits. In these specially prepared areas markets were held where the islanders could barter their products for those of the mainland. Their canoes were all carefully registered and a strict watch was kept over their movements. Fishing was prohibited everywhere along the lake shore, and all unregistered canoes were seized and destroyed.

During 1908 the removal of all the inhabitants of the lake shore in Busoga was completed. The people in that province are not so thoroughly under the authority of their chiefs as are those of Buganda, and the vast number of inlets, bays, promontories, and swamps, which characterise that part of the coast, rendered the process of complete evacuation a difficult one. It is believed, however, that the number of people who have succeeded in evading the orders of the Administration is extremely small, and may be considered a negligible quantity.

The right and left banks of the Victoria Nile were found to be badly infested by tsetse flies, and the people living in those localities were treated in the same way as those who had occupied the vicinity of the lake shore. They were all cleared out of a strip, two miles in width, on either bank of the river. Ferries were only permitted at two points between the Ripon Falls and Lake Kioga, and the approaches to these were rendered fly-free by extensive clearings. Wherever the main trade-routes, traversing the Protectorate, crossed rivers or streams where the presence of tsetse flies might be suspected, the necessary measures have been taken to remove the source of danger. Where such measures have proved impracticable, as for instance at the Murchison Falls, the ferries have been closed and the trade-routes deflected.

Special attention was given, of course, to the Entebbe Peninsula, and the town and its immediate vicinity are now absolutely free from danger.

It is almost impossible to find a single tsetse fly in the locality, and although the station is right on the shore of the lake, and was a few years ago a hotbed of sleeping-sickness, there is now practically no risk whatever of infection.

The measures which have proved so effective in the case of the Entebbe Peninsula have been applied also to the port of Jinja. The whole of the foreshore has been cleared and is now fly-free. In view of the proposed construction of the Victoria-Kioga Railway, Jinja is bound to attain a great development, and, in a measure as the town grows in size and population, the precautions against tsetse flies will have to be increased accordingly.

Kampala Port, the shipping place for the commercial capital, was created and laid out during the last two years. It used to be one of the most fly-ridden places on the lake shore, and the whole population has been completely wiped out by sleeping sickness. The clearing of a square mile of the dense forest which covered the site of the new town has entirely altered the situation. Tsetse flies have almost completely disappeared from its locality, and no danger need now be apprehended from them. Great care is, however, taken to prevent any native who shows the slightest signs of sleeping sickness from being employed at Kampala Port, and no native is allowed to work there until he has been medically examined and registered.

The work of clearing forest on the lake shore has been allowed only under careful restrictions and precautions. The natives are all specially selected, medically examined at regular intervals, and kept under close observation. Save in exceptional cases, no clearing is undertaken anywhere until the locality has been clear of inhabitants for at least six months. As an additional measure of precaution, all natives who work in the fly-belt are given clothing and other means of protecting themselves from being bitten, and it is believed that few, if any, of the labourers have contracted the disease while employed in clearing forest.

In view of the striking results obtained through the removal of all high vegetation from the shores of lakes and rivers, it is much to be deplored that such operations could not be carried out on a great scale. The cost of effective and permanent clearing is, however, so high as to be quite prohibitive, and it has not been found possible to do more than render safe such parts of the shores of the Victoria Nyanza as were absolutely required for purposes of trade and communications.

The extraordinary fertility of the soil in Uganda conduces to such a rapid growth of vegetation that the maintenance, in proper order, of the cleared places entailed a considerable and constant expenditure. It was therefore directed that all lands so cleared should be planted with citronella or lemon grass. This grass rapidly takes possession of the ground, and after a few months requires very little weeding. The foreshores at Entebbe, Kampala Port, and Jinja have all been planted up with this grass, and the fields are in a very flourishing condition. The cost of cultivation is very small, and the plantations present a neat and attractive appearance. There is reason to hope that the citronella grass not only carries out its main object, namely, the keeping down of rank

vegetation, but that it also drives away several kinds of noxious insects. Mosquitoes are seldom found in the neighbourhood of the plantations, and there is a noticeable absence of all other kinds of biting flies.

The growth of the citronella grass is so luxuriant that its cultivation in Uganda bids fair to be not only useful but also profitable. The leaves yield a considerable amount of valuable oil, and the experiments in distillation made during 1908 gave promising results. A distilling plant has been obtained from Ceylon, where the industry is a well-known one, and it has already been proved that the yield of oil per acre in Uganda is highly satisfactory.

At the end of 1908 it became evident that sleeping sickness was spreading to such an extent among the people who occupied the north-east corner of Lake Albert, that vigorous measures were required there also to combat the growing evil. The wholesale removal of the people of Bugungu was decided on, and although considerable difficulty was experienced in finding an area inland suitable for the location of such a large number of people, the problem was satisfactorily solved, and several thousands of families were moved, during March and April of 1909, to an unoccupied stretch of fertile country in the middle of Unyoro. In dealing with this matter, the King of Unyoro and some of his chiefs showed a good deal of intelligence and public spirit. A strip, fifteen miles wide, along the east bank of the Nile, in the Nile Province, was declared an infected area under the "Sleeping Sickness Ordnance" of 1908.

Ideas and theories as regards the nature and spread of sleeping sickness have been so persistently dinned into the heads of the natives throughout the Protectorate that even the most conservative and simple-minded peasant is beginning to be convinced of the soundness of the measures taken by the Administration. He is beginning to believe that the tsetse fly, so familiar to him, is really an enemy to be dreaded, and he is now realising that a habitation in the forests on the shores of the lakes or rivers means an early grave.

The Regents and Chiefs of Buganda are so convinced of this that they asked that the Government should authoritatively insist on the complete evacuation of Buvuma and of the Sesse Islands. The native authorities were ready to agree to any measures that might be found necessary to force the islanders to leave their homes, and promised to find suitable locations in Buganda for the 20,000 people who still survived in the islands. This put the finishing touch to the whole scheme. The exodus of the islanders was effected gradually, and is now completed. This means that nearly 100,000 persons have been removed from their homes and plantations.

The length of time which must elapse before these fertile tracts of land can be again inhabited must remain entirely uncertain until more is known of the life-history of the trypanosome, and of the length of time during which the flies can remain infective. Meantime most elaborate precautions are being taken to prevent any return by the natives to the regions from which they have been removed. The effect of the removal is visible in a great reduction of the mortality from the disease. As, however, there are still many thousands of natives in the Protectorate

who are infected, and as so far every person infected has died, a great many more deaths are to be expected even if no new infections take place.

In addition to the facts summarised above, the Report contains in addition a great deal of information about the segregation camps, where the unfortunate sufferers are kept until death comes slowly. A very remarkable fact, though one not without its parallels in cases of similar diseases, is that though still apparently always fatal the disease is now much slower in its effects than it used to be. At first it was believed that three years represented the maximum period of life of an infected person. The segregation camps still, however, contain many who have suffered from the disease for a longer period than this. The continued maintenance of these poor creatures naturally presents a problem of considerable difficulty, even though those not in an advanced stage of the disease are now being employed in forming plantations round the camps.

The whole Report affords very tragic reading, and the historian will be interested to observe curious parallels with the effects of the Black Death and other diseases of the Middle Ages.

A STUDY IN NOMADISM.

In vol. xxii. p. 648, we gave here a summary of an interesting investigation of a Swiss valley, which discussed in detail the curious modification of pastoral nomadism displayed by certain social groups in Switzerland. An interesting parallel to that investigation appears in the shape of an article by M. Louis Martrou on the nomadism of the Fans or Pahoins of the French Congo (*Revue de Géographie*, 3, 1909, pp. 479-524). The paper is a careful study of the elaborate series of seasonal and other migrations practised by this savage race, and it is interesting to note that there is a certain parallelism with the migrations of the Swiss pastoral folk, in spite of the enormous differences in the social level of the two groups.

M. Martrou's paper refers to the Fans which inhabit the region round the middle course of the Ogowe, that is a region extending for some hundreds of kilometres round Njole. The region is one of very varied topographical features, but includes for the most part hilly or mountainous regions, with in some parts that same alternation of fertile basins and rocky gorges which is so marked a feature in the High Alps.

The climate is of the equatorial type. The first rains begin in October and reach their maximum in November, with the result that towards the end of the latter month the rivers are all in flood. With December the rains diminish and the temperature rises, reaching in February and March a shade level of 100 F. This period constitutes the short dry season. The rivers fall, and as the isolation is very strong, and the ground is moist owing to the preceding rainy period, growth is at its maximum. This is therefore the ripening time for wild fruits, etc.

By the middle of March the rains recommence and last throughout April and May. The rivers again rise, and instead of the strong winds and gales of the October-November rainy period, tornadoes occur. June to September is the long dry season, with lowered temperature (minimum 62°-64° F.). The sky is grey and so densely covered with cloud that there is only about an hour's sunshine in the day. The intensity of vegetable life slackens, and some trees lose their leaves. The streams diminish, which greatly impedes navigation, but, on the other hand, facilitates fishing. This is the period of the year which is preferred by both natives and Europeans; the roads are dry, it is possible to sleep out of doors—in short, says M. Martrou, it is holiday time. These four seasons are the direct cause of the various migrations of the Fans—it is they which give the rhythm which punctuates their life.

The prime dwelling-place is the village, constituted by a family group, and inhabited by persons only separated by five or six generations from a common parent. So close is the parentage that intermarriage within the village group is forbidden. As there are no aqueducts, no cisterns, and no drains, the village is necessarily situated close to a river or streamlet, but is always sufficiently raised by the configuration of the ground to avoid risk of flooding at the periods of high water.

Each village consists of a street of huts, which are square in shape and are attached one to the other all down the two rows. A gallery runs down the front of the huts, and the extremities of the single street are closed by guard-huts. If the village is a large one, the central court may contain other guard-houses in addition. The men and women lodge in separate huts; and the guard-huts, besides their defensive function, serve as eating-rooms, meeting-places, and palaver-houses for the men of the village, and also for the reception of strangers. All the huts are very lightly built, of wood and bark, and are roofed with straw or leaves. Behind each row of huts stretches a banana plantation, where, in addition to bananas, small patches of sweet potatoes, etc., are grown. These patches are the property of the women, and the whole stretch serves both as the meeting-place of the women and as a cemetery. As the plantations are small in extent, they are comparable rather to the kitchen gardens of our farm-houses than to the fields. Their produce is utilised for chance guests, or when the weather does not permit of a journey to the large plantations, always placed at some little distance from the village.

The village is the centre of social life. Here marriage feasts are celebrated and the dead mourned, here the dances are held, and here the men assemble to discuss questions of social polity.

In addition to the village, however, there exist various other secondary settlements. As already indicated, the fishing season occurs in the height of the long dry season, that is, in the latter half of August, and as it lasts only about six weeks, almost the whole community migrates to the borders of some suitable stream or lake to take advantage of the lowered water-level. Here, after a grand feast of fresh fish, a part of the catch is dried by fire to serve as a store. The fishing villages are carefully constructed, and are well kept.

Again, another migration takes place at the time when it is necessary to attend to the plantations, which are always placed in the virgin forest, and therefore necessarily at some distance from the permanent village. Cultivation is carried on by the usual destructive African method, and thus the fertility of a gradually increasing area round the village is progressively destroyed, necessitating a longer and longer journey before a new plantation can be formed. The Fans have no astronomical calendar, but various signs, and especially the loss of its leaves by a particular large tree, inform them that it is time to prepare the ground, an operation which is most readily carried out during the duration of the winter dry season.

Both men and women help to clear the ground, now using European "machets" for the purpose. During this laborious process they live in a village near at hand, which is less carefully built than the true village, but is never entirely deserted, a few individuals always remaining to guard the crops against human and animal depredations.

After the removal of all the brushwood and smaller trees by the combined labour of men and women, the men attack the forest giants, which are cut down, with the exception of those which bear edible fruits, or which are too large for the instruments at their disposal. The work, begun at the end of January, lasts throughout February, and at the beginning of March the smaller branches, the twigs and the reeds are all burnt on the ground, and in the soft ashes the women plant bananas, manioc, and seedling gourds. By the middle of March the rains come to water the new-made plantation, which grows rapidly. The risks of severe famine are much less than in India, partly because the rainy seasons are more certain, and partly because the cultivated plants are on the whole very hardy. At the same time the signs upon which the native depends for his farmer's calendar may deceive him, and his plantation may fail to grow in consequence. There is no special harvest time, and therefore no storehouse. The plantation once made lasts two years, and a new one must be ready to take its place as it becomes exhausted.

In addition to this lengthy sojourn at the plantation, other visits of longer or shorter duration are made to it. In June the women return to weed the growing crops. In the middle of the long dry season, *i.e.* in August, the women also make minor clearings in which they sow maize, earth-nuts, cucumbers, capsicums, tomatoes, etc., which after being watered by the autumnal rainy period ripen in the sunny days of the short dry season.

Another method of food-getting is the hunting of the forest animals. This also must necessarily be carried on at a distance from the village, in some quiet spot where the prey finds its preferred food. Hither small groups of men betake themselves at the seasons regarded as most propitious, and here they build an encampment. A few women accompany the men, their office being to prepare food, to carry wood, and to dry a proportion of the meat for future use. The sojourn at such forest camps is limited by the fact that the necessary vegetable food must be carried to the forest, and the supply is soon exhausted.

Still another migration is determined by the gathering of the fruits

of the forest, many of which ripen in the winter dry season, and are favourite articles of diet. Where the harvest is plenteous some weeks may be spent in a particular locality in the collection of the fruits, and in such cases a temporary camp is built. In accordance with the usual rule that it is the women who busy themselves in the preparation of vegetable food, we find that the collection of forest fruits is carried on by them, the men building the camp, and protecting it and its inhabitants.

With the exploitation of the country by Europeans a new type of nomadism is developing—apart from the tendency of the community to disappear into the woods when the tax-collector is due. This consists in journeys to the forest in search of those forest products which enter into European trade, notably ebony and rubber, in exchange for which the natives obtain various articles of European manufacture.

With this object in view a group of men, accompanied by their wives, forms an encampment in a part of the forest rich in the product required. If it is ebony, then the men occupy themselves in cutting down the trees, and in reducing the trunks to logs of suitable size. The women then organise themselves into caravans and carry the logs to the nearest trading station. If the undertaking prospers, part of the proceeds are invested in the dowry of a new wife, to ensure the transport of a larger amount of wood next time.

With the development of the taste for trade and for European commodities, another step may be taken. An energetic individual sets forth, at those seasons of the year when work in the plantations does not press, on an extended trading journey, accompanied by his wives to act as beasts of burden. A visit is first made to a trading station, where various useful articles are bought. Then the party sets out for outlying regions of the forest, where no European stations are found, to trade the stock of European articles against ivory, rubber, and other products. If trade is brisk and the trader's stock is soon exhausted, he can always leave one of his wives as hostage, to be reclaimed later when fresh supplies have been obtained. So profitable is this trading that the natives watch with great discontent the spread of European stations up the rivers and into the forest, where they naturally destroy the native's simpler and more wasteful commerce.

So far we have spoken of the village as the settled place of residence, the home, from which longer or shorter migrations are made. But the village itself is only temporary. Built in the flimsiest fashion, it soon shows signs of wear and tear, and, at the end of four or six years, a process of radical reconstruction is necessary. Sometimes, though rarely, this reconstruction takes place, or a new village may be built close to the old. More frequently, as the houses begin to decay, a few members of the community migrate to a fresh locality, and there build a few provisional huts. These first occupants must lay out fresh plantations near the new village. If these prosper and the new locality appears suitable, the whole community, including the children and the old people, migrate to the new area. The early months are, however, a time of struggle. Food is scarce till the new gardens grow, and any chance mishap may determine a return movement to the old village, or a new migration

farther afield. If, however, all goes well, the first rough huts give place to the ordered village, where the community remains till caprice or necessity determines a new move.

The prime impulse to these migrations *en masse* seems to be the exhaustion of the fertile land within a convenient distance of the village, for although the secondary village enables the natives to work in the forest at some distance from their homes, yet the necessity of transporting the products to the main village sets a limit to the possible distance of plantation from permanent settlement.

Other factors which determine the movements are the depredations of wild animals. Elephants, for example, are so destructive to the plantations that no group of natives can subsist if these animals occur within a radius of twelve to eighteen miles of their plantations. The growing desire for European produce also causes the natives to approach the trading stations. Fundamentally, however, the nomadism may be said to be caused by the wasteful methods of agriculture, which mean that a very large area must be put under contribution to supply the needs of even a small group, and which every year destroy the fertility of a large tract of land. M. Martrou's study thus makes it once again abundantly clear that without his flocks and herds, without intensive agriculture, man, even in an equatorial climate, is forever within measurable reach of starvation. Not all the vaunted productivity of tropical plants can give him even a week's security from famine without an intelligent management of the soil, and a skilful husbanding of its fertility.

GEOGRAPHICAL NOTES.

EUROPE.

The Fiords of Norway.—In the *Revue Générale des Sciences* for April 30 last, Dr. M. C. F. Kolderup publishes a short illustrated article on the method of formation of the fiords of Norway. To a large extent the subject still remains obscure, for want of sufficiently detailed studies of the fiords, but certain general points at least are clear. It seems probable that from the Devonian period onwards for millions of years Norway was a land surface, so that the mountain chain formed at the close of the Silurian period was reduced to the condition of a peneplain, over which the ancient rivers flowed slowly, having lost all erosive force. In Tertiary times elevation took place, and the rivers reacquired an enormous erosive activity. During this period they not only hollowed out the great valleys now found at the western margin of the country, but also the continuations of those valleys which form the fiords, the present fiord region being then above the surface of the sea. Later, these valleys were further moulded by the ice, but their first outline was certainly preglacial, and the points still difficult and debated concern the relative part played by preglacial streams and the ice in the moulding of the surface. Some of the minor fiords were perhaps entirely

produced by glacial action. Since the close of the glacial period, according to Dr. Kolderup, there has been little change in the form of the valleys, the streams not having had time to produce much erosive effect.

The Gulf Stream Drift and British Weather.—Dr. H. Bassett contributes to *Nature* a short note on the effect of the Gulf Stream Drift on the weather of the British Islands, which is of considerable interest. It is, of course, a commonplace of the text-books that the fan-like extension of the Gulf Stream which passes our shores as the Gulf Stream Drift has some effect on the temperature of these islands, but hitherto detailed attempts have not been made to connect the state of the Drift and the weather. Dr. Bassett thinks that recent observations go to show that there is such a relation, and that in the future it may be possible to predict the general character of the weather in these islands several months in advance from the results of hydrographic observations. The following quotations from his paper show the line of reasoning adopted :—

"The immediate causes of the weather in the British Isles are undoubtedly to be sought in the various atmospheric disturbances which arrive from the Atlantic, but there can be no doubt that another very important factor to be considered is the temperature of the adjacent seas. This is influenced by the Gulf Stream Drift.

"The problem is, however, complicated by the fact that there is some doubt as to whether the Gulf Stream Drift may not be a direct result of the atmospheric circulation in the huge cyclonic system which rests over the North Atlantic, with its centre at Iceland.

"Be that as it may, there is undoubtedly a very intimate connection between the oceanic and atmospheric circulations in the North Atlantic region, so that if the atmospheric circulation becomes more vigorous, the Gulf Stream Drift moves faster, and *vice versâ*. Such a connection was, however, to be expected, not only if the Gulf Stream Drift were directly due to the atmospheric circulation, but also if, as seems more probable, both were due to the same cause, namely, the excessive cooling at the poles of the earth, coupled with the rotation of the earth about its axis. On this view both the oceanic and atmospheric circulations are of the nature of convection currents, and primarily due to the same cause, but in the course of ages these two distinct circulations have so adjusted themselves that any change in the one rapidly causes a corresponding change in the other.

"It seems probable, therefore, that the Gulf Stream Drift, owing to its inertia and its great heat capacity, should have a similar effect to that of the flywheel of an engine, and tend to obliterate the disturbances due to the more unstable and variable atmospheric circulation. In this case the Gulf Stream Drift should have a very considerable regulating influence on the *general* type of weather prevailing in the British Isles.

"Let us consider the probable influence on the temperature and on the rainfall. In the winter the temperature of the Gulf Stream Drift is higher than that of the land, while in the summer it is lower. Con-

sequently during the winter time the winds blowing from the Atlantic tend to raise the temperature of the land, while in the summer they tend to lower it, and it is clear that variations in the temperature of the Drift must be expected to affect the temperature of the winds blowing over it, and consequently the temperature on land as well. Such effects on the land temperature will probably be far more important in the winter than in the summer, owing to the relatively greater power of the solar radiation during the summer.

"The effect on the rainfall will be equally marked, for the amount of moisture carried by the winds and available for precipitation as rain depends largely upon the temperature of the sea over which they have blown. The warmer the sea the more moisture is taken up and the more precipitation may be expected on the neighbouring land.

"In this way, for instance, it is possible to account for the low rainfall last year in the western parts of Great Britain and Ireland—parts which are usually very wet—for during 1909 the temperature of the Gulf Stream Drift was below the normal, and hence the winds blowing from it were not so heavily charged with moisture as usual.

"The somewhat lower land temperature seems to have just about compensated for this by the time the winds reached the east of Great Britain, so that the rain fell there instead of in the west. The result of this was an abnormally high rainfall in the east, and with the low one in the west the rainfall over the British Isles as a whole was exactly equal to the average.

"It will be very interesting to see if this is what may be generally expected in years when the Gulf Stream Drift is weaker than usual."

Africa.

Handbook of Nyasaland.—We have received the second edition of this handbook, which though not official is compiled in part from official records. As we have devoted a considerable amount of space lately to reports and researches on tropical Africa, it may be sufficient in the present case simply to direct attention to the handbook, which is published at the price of 3s. by Messrs. Wyman and Sons, London. It contains a somewhat full section on the various cultivated plants of the Protectorate, which include cotton, tobacco, coffee, chilies, tea, wheat, fibres, ground-nuts, rubber, with small amounts of European vegetables.

America.

The Geography of Northern Yucatan.—In the May number of the *Bulletin* of the American Geographical Society, Dr. Cole gives a short account of the curious karst country of Northern Yucatan, and of the modifications in the life of the people produced by the nature of the water-supply. Though the region is well within the tropics, there is no luxuriant vegetation, forests being represented by scanty brushwood, and the whole region being a semi-arid plain. This is less due to deficient rainfall than to the porous limestone rock, which absorbs water like a

sponge, and which has only a scanty covering of soil. There are no rivers except a few short streams on the eastern coast, which are probably underground rivers whose roofs have fallen in. There are, however, a number of sinks, such as occur everywhere in limestone countries, and these contain water, which seems to stand at a common level in all the underground cavities. Along the northern coast the water gushes out in springs on the sea-floor, and in some cases the water is collected by placing hollow trees into the holes on the bottom, and the fresh water is thus led to the surface of the sea without any mingling with sea-water. The inhabitants of the coast villages thus sometimes obtain their drinking-water by going out to sea in their canoes. As this is only possible in fine weather, in storms they have to go some distance inland to get water. The coastal springs mark the outlets of the underground rivers, and the inland villages are placed upon the line of these streams, wherever the sinks are to be found.

An interesting fact is that in spite of the apparently unfavourable conditions, there was formerly a very highly civilised state in this region, the Mayas being, it would seem, the most advanced of the ancient Mexicans. Their cities were all built near large accessible sink-holes, for they did not dig wells. Now wells are to be found everywhere, the water from which is raised by American steel windmills, which are a conspicuous feature of the landscape.

Though small amounts of sugar-cane are grown, the two main crops are maize and henequen, which supplies the sisal fibre of commerce. The rainy season is from July to October, the rest of the year forming the dry season. In the dry season many of the trees lose their leaves, and many of the birds migrate, so that the country has a distinctly "wintery" aspect. The climate is generally healthy, the dryness and the cool nights being advantageous from the health point of view. Some yellow fever occurs, and there is also malaria, but it seems clear that it would be easy to diminish the number of mosquitoes by the exercise of a little care.

General.

The Atlantic Deep-Sea Expedition.—We quote from the *Times* some further details in regard to the work of this expedition, of whose progress and inception we have already given accounts here. The *Michael Sars*, it will be recollected, left Plymouth in April and began investigations off the west coast of Ireland, and along the European and African coasts as far south as Cape Bojador. From there the survey was continued to the Canaries, the Sargasso Sea, and the Azores, then across the Atlantic to St. Johns, Newfoundland, which was reached on July 3. During the cruise both physical and biological investigations were made at most of the seventy-four observing stations. The physical observations were carried out by Mr. Helland-Hansen. At sixty-five stations upwards of six hundred observations were made of the temperature of the water at different depths, and samples of sea-water were collected from the same depths.

The temperature was determined with an accuracy of 200 parts of a

degree (Centigrade), two thermometers being read at the same time. The same two deep-sea thermometers were used throughout the cruise. Besides this, several hundred observations of the surface temperature of the water were taken as the ship proceeded. These observations will furnish valuable information upon the different currents in these sections of the Atlantic, especially upon those moving to and from the Mediterranean, about the Canaries, the Azores, and the Gulf Stream. The observations of temperature agree very well with those of the *Challenger*, but the determination of the salinity and density of the water has furnished new results. The Ekman current meter was used in seventy measurements when the ship was anchored in the Straits of Gibraltar, and in ninety-five measurements on the slope south of the Azores. The measurements of the rate of the current in the Straits of Gibraltar were especially interesting. The limit between the upper (east going) and the lower (west going) currents was found to be situated at a depth of between 50 and 100 fathoms, varying in depth with the tide. The greatest velocities measured were about five knots, and velocities of about one to two knots were frequently observed in the upper as well as in the lower current.

Measurements of the intensity of light in different depths of the Sargasso Sea were made. A photographic plate exposed in 300 fathoms showed a very marked influence of the light, and even in 500 fathoms the effect could be clearly seen. At 900 fathoms no influence could be observed. The blue rays of light could be traced down to 300 fathoms, but the red and the green rays, which are absorbed in the upper layers, could not be traced at that depth.

The pelagic plants were investigated at the stations at which physical observations were made. Closing nets of the finest silk gauze were used for collecting the smallest pelagic plants in order that their distribution at different depths might be studied. Samples of water were centrifuged by a large centrifuge, driven by a steam winch. In this manner the minutest plants belonging to the Coccolithophoridæ were obtained. In the warm waters of the Sargasso Sea, where the tow-nets of the German Plankton Expedition obtained very few plants, the centrifuging of the water gave samples showing that the plants there consist in the main of the very smallest forms, which escape through the meshes of the finest silk nets: they were found in thousands in every litre of sea-water to a depth of about 50 fathoms. Professor Gran, a member of the party, found a great number of new species, and was able to make quantitative microscopic investigations, and thereby determine the vertical distribution of the different species. The smallest species of plants (the Coccolithophoridæ) are to be found in greatest numbers in the warm seas, but even on the great bank off Newfoundland, in water of 35 -37° Fahrenheit, two living species were found in considerable numbers (50 cells to a litre). The great number of pelagic animals living there feed especially on naked brown flagellates, too small to be caught with the silk nets, which were found in the cold waters in thousands to a litre.

In order to capture a greater number of the larger animals, such as deep-sea fishes, a series of tow-nets and young fish trawls were attached

to wire ropes and towed for a period of about twelve hours. In this way nine nets were towed at the following depths:—Surface, 25, 50, 75, 500, 1000, 1500, and 2000 fathoms. This procedure was undertaken at twenty stations, and furnished a great number of individuals and many new species of deep-sea fishes and other animals. In order to obtain exact information of the depth in which different species were living, a large tow-net of 3 yards in diameter, which could be closed at any depth, was used. Pelagic fishes were thus found in all depths, but were scarce in number in the deepest layers of the ocean.

The fauna of the bottom was investigated by the use of a large otter-trawl of 50 feet head-rope. Fourteen hauls were made with this trawl, the deepest in 2900 fathoms. At this great depth very few species of animals were found, although the trawl worked more or less satisfactorily. In lesser depths, such as 500 and 1400 fathoms, large hauls were made. For instance, off the west coast of Ireland 330 deep-sea fishes were caught in a haul at a depth of 500 fathoms.

The temperature section across the Gulf Stream to the south of the Great Banks showed somewhat extraordinary and unexpected results. Both the temperature and the Plankton indicate a counter-current at the southern border of the Gulf Stream. In consequence of this the *Michael Sars* followed the course of the Gulf Stream across the Atlantic, taking observations on the way, instead of going to Iceland, as was originally intended.

The Modelling of Climatological Data.—A short note in *Science* gives an account of a new method of representing the results of observations on temperature. Mr. Andrew Palmer has constructed a model in plaster-of-Paris which represents the mean hourly temperatures of Boston, Mass. The model is two feet long and one foot wide, and its three dimensions represent months, hours, and temperatures. On one of the vertical sides lines are drawn, at equal distances apart, to show the twenty-four hours, and on the next vertical side twelve lines to represent the months. The heights of the upper surface of the model, above the base, represent the mean hourly temperatures. This upper surface is divided into twelve areas, representing different degrees of heat and cold, and each area is coloured, different shades of red being used for the higher temperatures, and different shades of blue for the lower. By means of this model it is possible to ascertain, easily and with great accuracy, the mean temperature of any hour of any month of the year. The data forming the basis of the construction are those obtained at the Boston station of the United States Weather Bureau during the period 1890-1905. The total number of observations used was 131,472. According to the author, the idea of modelling climatological data in this way is a new one, and is likely to be further developed in the future.

The Variations of Glaciers.—The fourteenth Report on the periodic variations of glaciers, giving the figures for the year 1908, has recently reached us. The results are practically the same as those for previous years—the glaciers over the surface of the globe are, generally

speaking, retreating. The glaciers of Norway, which in 1907 were, as regards the majority, increasing slightly, were in 1908, with a certain number of exceptions, decreasing, though 10 out of the total of 32 measured are still increasing. This increase appears also to be extending to the Swedish glaciers. Elsewhere the tale of decrease is almost universal, though certain very small glaciers in the Alps of Vaud seem to be showing signs of increase.

Commercial Geography.

Traffic through the Sault Ste. Marie Canals.—A note in the *Times* gives some interesting figures in regard to this subject. It will be remembered that Lakes Huron and Superior are connected by the St. Mary River, which has at its upper end a series of rapids three-quarters of a mile in length, which from early days constituted an obstacle to navigation. The obstacle was at first got over by means of a portage, then in 1797 by a very primitive canal with a lock 9 ft. 9 in. wide, and later by no less than three sets of locks, two on the American and one on the Canadian side. These locks constitute the Sault Ste. Marie Canals, and through them the whole of the traffic between Superior and Huron passes, so that they form a sort of meter of the whole lake commerce in so far as it passes by water. The total freight which passed the locks in 1909 reached nearly 58,000,000 tons, of which nearly 3,500,000 tons was wheat. The largest single item is represented by iron ore, of which nearly 40,000,000 tons were carried. The most noticeable recent feature of the traffic, apart from its steady increase, is the fact that the numbers of the ships do not increase with the increase of freights. In other words, the size of the individual vessels is always increasing. The declared value of the freight carried in 1909 was £125,250,000, and of this 94 per cent. was carried by American vessels and 6 per cent. by Canadian vessels, a fact which, together with the greater number of American than of Canadian vessels, suggests the undeveloped condition of the northern shores of the lakes as compared with the southern.

Fruit Production of the British Empire.—In the March issue of the *Journal of the Royal Society of Arts*, which has been recently added to our list of exchanges, there appears an interesting article on this subject by the Hon. John M'Call, M.D., Agent-General for Tasmania. Dr. M'Call points out in the first instance that fruit will in many cases grow on land which is not sufficiently fertile for general agriculture or mixed farming, and that in many places it is also highly profitable. Thus in Tasmania apple-growing produces a profit of about £40 per acre. In the case of Tasmania the indirect advantages of the apple industry are great, for the export trade is sufficiently large to make it worth while for large liners and mail steamers to call at Hobart during the apple season, and this brings many tourists and others, and stimulates general trade. Further, the fruit trade gives rise in many places to subsidiary industries such as jam-making, the drying of fruit, making of boxes, bottles, tins,

and so forth. More interesting, perhaps, is the relation of bee-keeping to the fruit industry. The quality of the fruit (in the case of apples, etc.) has been shown to be improved by cross-pollination, and thus it is advisable to have bee-hives in the orchards. The bees, as well as fulfilling their prime function as agents of cross-pollination, yield with good management a handsome subsidiary profit in addition.

Dr. M'Call estimates the total acreage under fruit in the whole British Empire at over six million acres. He then proceeds to give some details of the fruit production in the different regions, noting especially the advantage which Canada possesses in her nearness to the European market, and the steady increase in the fruit production of British Columbia.

In South Africa half of the total area available for fruit is under vines, but, as is well known, the Governments of the Cape of Good Hope and of Natal are trying to encourage the export of pears, plums, and pines. The fruit industry in this region is, however, still in its infancy, and is handicapped by the fact that the timber for boxes and crates has to be imported. In India an enormous amount of fruit and vegetables is produced, but the resident Europeans consume a large amount of this, and the rest seems to be chiefly for native use. In Ceylon much of the product is also for home use, but in 1907 nearly £2,000,000 worth of cocoanut palm produce was exported. In Jamaica the Government's efforts to promote the fruit industry have met with great success, for in 1907-8 the value of the bananas exported reached over £1,000,000, as compared with only £77,000 for oranges. In Australia the fruit industry is steadily developing, though as yet Tasmanian apples form the chief fruit export. In the far north there is a large area which seems well adapted for tropical fruits, which are already being grown by Chinese, and if this region were developed, and connected by rail with other parts of the country, there is no doubt that a large fruit industry might be developed. As regards the United Kingdom, the interesting fact is noted that fruit can be brought to London from thousands of miles across the sea more cheaply than from the fruit-growing counties in England.

NEW BOOKS.

EUROPE.

Grieben's Guide Books. Berlin: Albert Goldschmidt. London: Williams and Norgate. Vol. 124. *The Lakes of Northern Italy.* 4 Maps. 1909. *Price* 3*s.* Vol. 126. *Norway and Copenhagen.* 6 Maps. 1909. *Price* 3*s.* Vol. 128. *Dresden and Environs.* 3 Maps and 4 Plans. 1910. *Price* 1*s.* 6*d.* Vol. 129. *The Rhine.* 7 Maps. 1910. *Price* 3*s.*

These little guides have many popular features to recommend them. The size is very compact and convenient, too much information is not inflicted upon the tourist, but what is given is essentially practical, whilst the maps are simple and clear. One can scarcely expect any very adequate treatment of Norway and Copenhagen in 130 small pages, nevertheless all the principal tourist routes are dealt with in this space. The editors of this new series have no doubt come to

realise the fact that the majority of tourists simply rush through a country, glancing at the chief sights, and altogether fail to appreciate the detail and research of a "Baddeley" or a "Baedeker."

Baedeker's Great Britain. Seventh Edition. Revised and Augmented, 1910. With 28 Maps, 65 Plans, and a Panorama. *Price* 10*s. net.* Leipzig: Karl Baedeker. London: T. Fisher Unwin.

Compared with the last edition, four years ago, this new issue is enriched with 6 new Maps, 8 new Plans, and 20 extra pages of text. This indicates to some extent the thorough manner in which the editor has done his revision, and, so far as we have tested it, we have detected only a few trifling mistakes. In these motoring days it is important to note that there is now a bridge, instead of a ferry, over the river Hope between Eriboll and Tongue.

Baedeker's Southern Germany (Wurtemberg and Bavaria). Eleventh Revised Edition, 1910. With 36 Maps and 45 Plans. *Price* 6*s. net.* Leipzig: Karl Baedeker. London: T. Fisher Unwin.

Baedeker's Northern France: From Belgium and the English Channel to the Loire, excluding Paris and its Environs. Fifth Edition, 1909. With 16 Maps and 55 Plans. *Price* 7*s.* 6*d. net.* Leipzig: Karl Baedeker. London: T. Fisher Unwin.

In the matter of guide books one often hesitates to purchase a new edition if the last one is not more than ten years old, but in the case of Baedeker one is assured that the expenditure will probably be justified. Both these new editions of Southern Germany and Northern France have been so much improved and amplified with new maps and plans and revision to date that we are forced to realise that our old Baedekers are now more or less obsolete.

The Sportsman's and Tourist's Guide to the Rivers, Lochs, Moors, and Deer-forests of Scotland. Edited by J. Watson Lyall and Co., Ltd. Summer issue, May, June, and July 1910. London. *Price* 1*s.*

This is a useful and old-established guide, the present being the thirty-eighth year of publication. Though the general scheme is good, and the guide when first compiled was probably quite satisfactory, we think that it is time it was reconstructed and brought more definitely up to date. Even the most casual inspection suggests some slackness. Thus though the issue sent to us is stated to be for May, June, and July 1910, in the time-tables the summer trains are not given. It is true that the reader is warned that trains *may alter* after June 30, but as the main lines have special summer trains, these at least could surely have been inserted. Similarly we notice that the list of golf greens in Midlothian is not up to date, a fact which does not inspire confidence in the lists compiled for more remote counties. Many of the articles also show signs of not having been revised for a number of years. The book as a whole is so useful that we hope the publishers will consider the necessity for an early and radical reconstruction.

A Corner of Spain. By Walter Wood. With an Introduction by Martin Hume. London: Eveleigh Nash, 1910. *Price* 5*s. net.*

This copiously illustrated little book gives an account of the province of Galicia, a region which is now endeavouring to attract tourists. Mr. Wood gives an

attractive picture of its charms, with detailed accounts of Vigo, Santiago, Mondariz, Corunna, and the island of La Toja, where a very large hotel is now being built, and where the tourist may indulge in the game of golf on the only Spanish course known to exist. The book, which is written in a light and interesting style, will appeal to those in search of new holiday resorts. There are numerous coloured plates, some of which are successful, while others seem to us rather crude.

Excursions Botaniques en Espagne et Portugal. Par Robert Chodat. Geneva: Eugène Froreisen, 1909.

This small pamphlet was received some months ago, and if it has hitherto escaped notice it has not been because of neglect, but because the prospective reviewer desired to study it during a visit to part of the region described in its pages. A visit to Portugal and parts of Spain is now made so easy that many who have made or propose to make the trip may be glad to have their attention called to Professor Chodat's work, which one traveller at least found a charming companion.

Professor Chodat is in the habit of making botanical excursions with his students every spring, and in successive years the party have botanised from the sources of the Rhone to the shores of the Mediterranean. A continuation westward of the same series of journeys naturally led to Spain and Portugal, and the present pamphlet gives a summary account of this last journey, begun towards the end of March 1908. The party studied the plants found according to modern methods, that is, the emphasis is laid upon plant associations, and thus the descriptions have a geographical as distinguished from a purely botanical interest. Nor are little touches of human interest wanting. Spain made a somewhat disagreeable impression upon the travellers, who much preferred Portugal, which M. Chodat characterises as European and modern, as contrasted with the half-Saracen, half-Visigoth Spain. M. Chodat also emphasises the difference between the luxuriant vegetation of Portugal, subject to an oceanic and relatively damp climate, and the desert aspect of much of the interior of Spain. We cannot follow in detail the journey of the party, which included a crossing of the Sierra del Pinar in the snow, but can only cordially recommend the booklet to all persons who are interested in plants, and who think of visiting the Iberian peninsula. The descriptions of the botanical garden of Lisbon, of Cintra, and of the gardens of Monserrat —all show places, and all places where the plant-lover is apt to be bewildered by the number and luxuriance of the plants—may be noted as especially interesting and useful.

Alpine Profile Road Book of Switzerland and adjacent portions of the Tyrol and the Italian Lake District. Comprising Profiles of the Roads, with Gradients; Notes on the Passes; Tables of Distances and Elevations. Compiled and Edited by R. H. U. Ellis, C.T.C. London and Edinburgh: Thomas Nelson and Sons, 1910.

Not only those persons who contemplate a cycle tour in the Alps but many others also will have occasion to be grateful to Mr. Ellis for this most useful compilation. The great advantage of bicycling is that it gives the rider a kind of impression of the road not easily got in any other way, and when, as in the present instance, the personal impression is checked and verified by all the various measurements possible, the result is a picture of the route as useful to the walker and the geographer as to the cyclist himself. Anyone going to the Alps who is able and willing to do any cycling or walking should consult this little book, which gives

useful hints as to tours, and excellent descriptions of the main passes. How liberal a view Mr. Ellis takes of the cyclist's powers may be understood when it is stated that he includes the Gemmi in his list of possible passes. The book is small and of a handy size so that it will slip easily into the pocket of the traveller, and may be cordially welcomed as a great addition to Alpine literature.

ASIA.

Chez les Jaunes: Japon, Chine, Mandchourie. Par Jules Leclercq. Paris: Plon-Nourrit et Cie. *Price* 4 *francs.*

M. Leclercq, who has already given to the world some ten or a dozen books of travels, and who may be therefore accounted a professional travel-writer, here discourses on his recent journey to Japan by the C.P.R. route, and thence to China and home by the Trans-Siberian railway. In his present book we have the views of a shrewd and cultured observer, expressed, perhaps, with a superfluous wealth of detail given to the description of scenes which the accounts of others have long rendered familiar to the reader. But M. Leclercq has the knack of making his story both bright and interesting, though his tone is by no means always sympathetic, and it is plain that he is not a very friendly critic either towards the Japanese or to the English whom he encounters. For example, he says of the Japanese that "they installed themselves in Formosa after having massacred the natives whom they found troublesome." "This," he adds, "is one system of colonisation, like another we know of." A most unjust accusation, we believe, against the Japanese and their policy in Formosa. One cannot help wondering what he thinks of the fiasco of the French expedition to Formosa in 1884! He never loses a chance of having a fling at the British, whom he stigmatises as *cette éternelle race de proie.* He empties the vials of his wrath on a party of missionaries which he encounters on the hills at Karuisawa, the well-known health resort in Japan, and wishes that Pierre Loti had been there to see. "Quelle juste indignation," he writes, "n'eût-il pas éprouvée devant la profanation du sol japonais par ce flot d'inquiétantes Anglaises que déversent les sociétés d'évangélisation protestante partout où il y a des populations à exploiter! Le Japon en est inondé!" As a matter of fact, most of the 600 missionaries who were at Karuisawa for the hot months were probably Americans. The same lack of fairness characterises his remarks on any English missionaries whom he encounters in China, and he actually boasts of having vacated his cabin on a river steamer on the Yangtsze rather than let it be shared by one of these detested clerics. Conversely, his appreciation of the French missionaries in China knows no bounds.

For the Yangtsze, M. Leclercq persists in using the absurd and fanciful French name of "Fleuve Bleu," for which there is no warrant, either in the name (signifying "little ocean") or in the colour of the turgid yellow current itself. We think Reclus gives some explanation of the French name.

M. Leclercq quits Japan without regret, announcing that he shares the opinion of a French friend as to its being "a vastly over-rated country," and he declares that the only japonophiles whom he met amongst the foreign colony were the French Minister and his wife. There is a spice of truth in this, for a prophet is not without honour, save in his own country; but the author's tone of lofty superiority towards most things Japanese probably arises in a measure from lack of sympathy. As against this, we may instance his account of the public library in the Uyeno Park at Tokyo, which is remarkably good; while his pictures of the capital of Japan, and the life of its inhabitants, are illuminative of the genius of the people. As regards the relations of Japan with the West, M. Leclercq gives

it as his opinion that under a mask of politeness the Japanese hide a profound aversion towards Europeans.

Throughout the whole of his journey, our author is very insistent on the subject of his fare, and he never omits a chance of enlarging on the petty discomforts of travel, although of real roughing it there is little or no trace in the book. The most part of his complaints about the dirt of Chinese cities, like Hankow and Kiukiang, may be accepted as fairly correct; but a more sympathetic traveller would have found in these conditions but a parallel to what existed in mediæval Europe, and would have had eyes for more than the dirt. The Chinese soldier is not so much of a "guerrier pour rire" as M. Leclercq imagines him to be.

We can recommend the author's account of the journey from Peking to Moscow by the Trans-Siberian, which is still new enough to bear telling about, and the whole book is worth reading as an impression of well-known scenes viewed through French spectacles.

AFRICA.

To Abyssinia through an Unknown Land. By Captain C. H. Stigand, F.R.G.S., F.Z.S. London: Seeley and Co., Limited, 1910. *Price* 16*s. net.*

This is an entertaining account of the journey from Uganda through unexplored regions of British East Africa by Lake Rudolph to Abyssinia, undertaken by the author alone, with a native following, during a year's leave of absence. To provide funds for the expedition he first went elephant-hunting in Uganda and the Congo, with a brother officer. He was successful, but found the time left all too short for his expedition.

He details his preparations for the journey, and emphasies the importance of having proper trading goods for such an expedition. "Some people," he says, "seem to have an idea that a naked savage ought to be glad to receive anything from a European, but this is not the case. If you do not take exactly what he wants, you will be unable to purchase food or anything else, although you may have hundreds of pounds' worth of goods. . . . In one part of the Lado enclave, the most valuable goods for barter are empty plain glass bottles, such as gin or Worcester Sauce bottles. Out of these the natives chip lip ornaments."

A great part of the journey ran through a waterless region, where Captain Stigand had great difficulty in estimating the distances. If he asked his guides how far off was the next water-hole, it was always six hours distant. If he camped there, and asked the distance next morning to the same place, it was always four hours. The mirage, too, was misleading, giving to small swamps the effect of enormous tracts with hundreds of camels wading knee-deep. He travelled through the Laikipia plains and the Samburr country, where no white man had been before him. The native men were naked, save for a patch of skin hanging from the shoulders. The women were carefully dressed all over in skins drawn in at the waist by a cord, and the lower part worn in the "directoire" style. Their taste in food was strange: they brought in gourds of milk of all ages and states of decomposition, from fresh milk to curdled milk a few weeks old. Most natives appreciate the old and curdled milk, and would not thank you for fresh.

Captain Stigand met large game in numbers. On one occasion he saw six lions at once, and rhinoceros were frequent, their "puff puff" in the bush being a sound as familiar as the "rasping hurr" of lions. The sheep of the country were of a curious fat-tailed variety, and were able to withstand short periods of drought and poor grazing, the fat of the tail acting as a reservoir from which

nutriment is drawn. One of these had a tail so huge that it was hardly able to move. Without camels the journey could not have been accomplished.

The Rendile tribe reminded the author of the Somalis, and he supposes that they had been driven out of Somaliland where they had been more or less Mohammedans, but this had been forgotten, and they have reverted to their ancient belief in a Supreme Being and spirits. Some of the native practices are strange and objectionable, such as that of seizing a traveller's hands and spitting on them, by which they mean to convey a blessing.

The heat in this region was great. Near Lake Rudolph the rocks were so hot that it was impossible to rest the hand on them. The wealth of bird-life on the lake is remarkable. A few yards from the shore there was one long line of aquatic birds the whole length of the lake, the shallow water with multitudes of small fish affording them a capital fishing ground.

After leaving Lake Rudolph the author travelled by the Omo river and the Neri desert. On the banks of the Omo were three small tribes known as the Kerre, the Banna, and Bashada tribes, all of which are in the habit of strangling their first-born children and throwing away the bodies. Amongst these tribes this custom is universal amongst rich and poor. The chief of the Kerre said laughing, "If I had a child now it would have to be thrown away." He was amused that Captain Stigand should be interested in the custom.

The journey ended at Addis Ababa, whence Captain Stigand travelled by Jibuti, and crossed to Aden, sending his native servants back by steamer to Mombasa.

The whole volume is full of incident and of information about a land and peoples and their customs hitherto almost entirely unknown. It is illustrated with many views, portraits, and groups of natives.

AMERICA.

Les Iles Malouines. Par Paul Groussac. Buenos Aires: Coni Frères, 1910.

The British occupation of the Falkland Islands has never ceased to be a bone of contention to the Argentines, who persist in their claim to the ownership of the islands. Monsieur P. Groussac has made a study of the historical evidence bearing on the question, which he has published in *Annales de la Bibliotheca Nacional de Buenos Aires*, and republished as a volume of some 200 pages. The conclusion which he arrives at, and states most emphatically, is that the Falklands are Argentine territory, alike by priority of discovery, by effective occupation, and by natural relationship and proximity to Argentina. The latter, strictly geographical reasons though they be, cannot however be admitted as arguments. M. Groussac is evidently a scholarly historian—his accuracy as regards names and dates, and his copious references to original documents, state papers, and other works show this—but unfortunately, though he expresses his opinions with characteristic politeness and moderation, he allows his conclusions to run beyond his facts at times.

While he may have some grounds for questioning whether Hawkins' Maiden Land was the Falklands, he is scarcely justified in refusing to accept Davis's discovery of the islands in 1502. The honour of discovery he ascribes to the Dutchman Sebald de Weert in 1598. In any case the discovery was no Spanish one. There seems to have been no definite settlement until 1764, when Bougainville founded St. Louis on Berkeley Sound and appears to have taken possession of the islands in the name of France. In 1765 Port Egmont was founded by Captain Byron with

H.M.SS. *Dolphin* and *Tamar*. Byron took possession of the harbour and all the neighbouring islands in the name of George III. The French and British colonies were not ignorant of one another's existence, nor did they show mutual hostility. In 1767 France ceded her colony to Spain. Soon after the British colony was forcibly expelled by Spain, but reinstated a few years later. Spain in restoring Port Egmont denied that this in any way affected her claim to the sovereignty of the Falklands, but her action scarcely bore out this contention. In 1774 Port Egmont was evacuated and Britain's direct connection with the Falklands ceased for some years, but she never dropped her claim to ownership. The Spanish occupation was apparently continuous, until in 1833 H.M.S. *Clio* took possession of the settlement in Berkeley Sound, and hoisted the British flag without any opposition being offered. This may appear to have been a somewhat piratical act, but it must be remembered that the British claim dated from 1765, and had not been disputed at that date by the only other claimants at the time, the French. In effective settlement we must admit that the Argentines, legal successors to the Spanish, who in turn followed the French, have the prior claim ; but why then was Britain, less than a year after the foundation of the settlement of Port Louis, allowed to assert, without dispute, a claim to the islands? That very fact seems to negative all claims to sovereignty previous to the British. M. Groussac hints that a possible solution to the vexed question might be found in partition of the islands, through Falkland Sound, between Britain and Argentina : but the Falklands are a small morsel to divide, even were this country called upon to do so in the cause of international equity.

The Argentine Republic would be better advised to drop her claim to the Falklands, and, on the other hand, to assert her claim to the South Orkneys, a claim which is indisputable despite our annexation of those islands.

GENERAL.

Man in Many Lands: Being an Introduction to the Study of Geographic Control. By L. W. Lyde, M.A., F.R.G.S. London: Adam and Charles Black, 1910. *Price 2s. 6d.*

In this volume Professor Lyde offers to the student a mass of raw material gathered from all parts of the world as a basis for the study of "Geographic Control." We are rather averse to the multiplication of technical terms unless it is absolutely essential, and even then it is better to invent a new word than to force a new meaning upon an old one. In this case "Control" means the influence of environment, and it seems to us that the latter word could be used alone without undue strain upon the meaning. The book itself, however, is brightly written, and contains many stimulating suggestions. The first few pages are rather bewildering, as one has a helpless sort of feeling that some of the steps in the argument are left out. They will prove rather a stumbling-block at least to the average schoolboy, but, once they are passed, the interest is well maintained. There are 24 illustrations in colour after various artists which add greatly to the attractiveness of the book. We specially commend Dunkeld, by Sutton Palmer (p. 9) ; Birches, by Adrian Stokes (p. 89) ; and the Swiss Alp, by G. Flemwell (p. 176).

We note a few suggestions for amendment. There are no ruined castles at Melrose, Dryburgh, and Kelso (p. 8). It is not correct to say that eider-down is as commonly used in Iceland as silk is in Japan (p. 31) ; most of the Icelandic eider-down is exported. Assam (p. 37) should be Annam. On p. 118 the musk-ox or Arctic ox is left out of account, and, indeed, the whole argument as to the reason

for the reindeer being tamed by the Lapps and not by the Eskimo is unsound. If the sole reason for the reindeer being tamed by the Lapps is that there is sufficient pasture for them in Lapland in winter, and that therefore they do not migrate southwards, then the Arctic ox should be domesticated among the Eskimos.

La Grande Boucle. Par Maurice Rondet Saint. Paris: Plon-Nourrit et Cie. 1910. *Price* 3 *fr.* 50.

Under the title of "The Great Ring" the author describes his journey round the world from Genoa to the Far East, and then to Vancouver and south to Valparaiso, crossing by railway to Buenos Ayres, whence he sailed to Brazil and France. He is a keen observer, and as he writes principally for Frenchmen, he notes how the latter are often distanced abroad by the British, Germans, and others. In sight of Port Arthur he soliloquises as follows: "It was upon that rock that the Japanese, after their victory over the Chinese, placed the first foundations of their future success. Waterloo was above all the fall of one man, Sedan that of a dynasty, and the result of a rivalry for predominance in Europe. Here, if it is not the retreat of our race before another race, it is at all events a check causing an echo to resound throughout the Asiatic and even the Mussulman world, and sending a thrill through the peoples placed under the domination of the white man. It is finally a proof to the enormous Chinese masses hitherto asleep and unconscious of their latent force, that the yellow men could vanquish one of the most formidable armies of the world, insist upon receiving the respect of the nations, and become likewise in a modern sense a great people. At Port Arthur a new chapter was opened in the history of the world." With regard to the languages observed on his route, the author found only two dominating, English and Spanish. He considered that German would be of no use to travellers, for Germans are assimilated by the countries they settle in; while French is only known a little in South America. English is the language of the Far East, being employed in China and Japan in most official and commercial notices.

The Senior Scientific Geography. By Ellis W. Heaton, B.Sc., F.G.S. London: Ralph Holland and Co., 1910. *Price* 5*s. net.*

We have reviewed here as they appeared the separate parts of Mr. Heaton's new Geography. The present volume is in large part made up of these separate parts, with some alterations and omissions and some additions, notably a new chapter on South Africa and a section on South America. The book is very comprehensive, including both Physical and Political Geography, and will be found useful especially as a means of revision by relatively advanced students. The maps, diagrams, and sketches, though rough, are useful and often suggestive. Considering the enormous mass of material contained, the book seems to us to be very cheap, and it is also well adapted for the purpose for which it is intended.

The Diary of a Soldier of Fortune. By Stanley Portal Hyatt. London: T. Werner Laurie, 1910. *Price* 12*s.* 6*d. net.*

This is rather a painful book, which narrates the author's experiences in various parts of the world, especially in the less settled parts of the Empire and in the Philippines. The author has played a great variety of parts, and his book describes what may be called the seamy side of empire, both in South Africa and in the United States' Asiatic possessions. The geographical interest is only incidental, in the light thrown upon men and manners in the less well-known parts of the world.

The Statesman's Year-book, 1910. Edited by J. Scott Keltie, LL.D. With the assistance of J. P. A. Renwick, M.A., LL.B. Forty-seventh annual publication. London: Macmillan and Co., Ltd., 1910. *Price* 10*s.* 6*d. net.*

As usual, the most interesting geographical feature of the new *Statesman's Year-book* is to be found in the maps, for the text as a whole must naturally follow the same plan year by year, with the necessary alterations to keep it up to date. The present issue contains eight maps, all dealing with matters of current interest. The most striking perhaps is one showing, by a comparison of the 1801 and the 1901 censuses, the increase in the urban and the decrease in the rural population in the United Kingdom during the course of the nineteenth century. Ireland, Scotland, and England and Wales are shown separately, and the colouring is so admirably arranged that the main facts stand out at a glance. These main facts are no doubt familiar to all, but their representation in graphic form renders them much more impressive than they could otherwise be. The obvious deduction to be drawn from them is that in view of the enormous changes in the distribution of population which have occurred during the short period of one hundred years, it is not surprising that the social organism shows signs of being somewhat out of gear. Those who feel overwhelmed by the existence of many admitted social evils, may find some consolation in the thought that there has not yet been time for the necessary readjustments to be made.

Among other interesting maps we notice one showing the course of the Georgian Bay Ship-canal, three illustrating progress in connection with African and South American railways, and one showing the position of the new Federal District and Capital of the Australian Commonwealth.

Transactions of the Highland and Agricultural Society of Scotland. Published annually. Vol. xxii., with Index to vols. xv.-xxi. Edinburgh: Blackwood and Sons, 1910.

In this useful annual two articles may be noted as of direct interest to geographers. One, by Mr. James Hendrick, is on the soya bean, which is being put upon the market of the United Kingdom in steadily increasing amounts. Though it has been known in Europe for a generation, it first appeared in British markets in bulk in 1908, and in 1909 half a million tons were shipped to the United Kingdom. To the geographer the soya bean has of course long been known as a very important article of diet in the East, especially in China and Japan. It is possible that it may acquire some importance as an article of human food in the United States and in Europe, but meantime it is commercially valuable as a cattle food, and also as a source of oil for soap. As a cattle food it is at present very cheap, partly because there has been some hesitation in taking full advantage of it on account of a fear of cattle poisoning, such as has occurred with Java beans. It seems, however, to be a very valuable though highly concentrated food for cattle, and cattle fed upon it yield manure of great value. The geographer will therefore be interested to note that with the export of soya beans from Manchuria, part of the mineral constituents of the soil there are being removed to enrich the soil of Great Britain.

The other article to which allusion has been made is one on the cereal and other crops of Scotland in 1909 considered in relation to the weather. The meteorological part of this article has been written by Mr. Andrew Watt.

THE SCOTTISH

GEOGRAPHICAL

MAGAZINE.

SOME ASPECTS OF THE GLACIAL HISTORY OF WESTERN EUROPE.[1]

By the Rev. Professor T. G. Bonney, Sc.D., LL.D., F.R.S.

You often permit your President on these occasions to speak of a subject in which he takes a special interest, and I prefer thus trespassing on your kindness to attempting a general review of recent progress in science. I do not, however, propose, as you might naturally expect, to discuss some branch of petrology; though for this no place could be more appropriate than Sheffield, since it was the birthplace and the life-long home of Henry Clifton Sorby, who may truly be called the father of that science. This title he won when, a little more than sixty years ago, he began to study the structure and mineral composition of rocks by examining thin sections of them under the microscope.[2] A rare combination of a singularly versatile and active intellect with accurate thought and sound judgment, shrewd in nature, as became a Yorkshireman, yet gentle, kindly, and unselfish, he was one whom his friends loved and of whom this city may well be proud. Sorby's name will be kept alive among you by the Professorship of Geology which he has endowed in your University; but, as the funds will not be available for some time, and as that science is so intimately connected with metallurgy, coal-mining, and engineering, I venture to express a hope that some of your wealthier citizens will provide for the temporary deficiency, and thus worthily commemorate one so distinguished.

[1] Presidential Address delivered before the Sheffield Meeting of the British Association for the Advancement of Science, 1910.

[2] His subsequent investigations into the microscopic structure of steel and other alloys of iron, in the manufacture of which your city holds a foremost place, have been extended by Mr. J. E. Stead and others, and they, besides being of great value to industrial progress, have thrown important sidelights on more than one dark place in petrology.

But to return. I have not selected petrology as my subject, partly because I think that the great attention which its more minute details have of late received has tended to limit rather than to broaden our views, while for a survey of our present position it is enough to refer to the suggestive and comprehensive volume published last year by Mr. A. Harker:[1] partly, also, because the discussion of any branch of petrology would involve so many technicalities that I fear it would be found tedious by a large majority of my audience. So I have preferred to discuss some questions relating to the effects of ice which had engaged my attention a dozen years before I attempted the study of rock slices. As much of my petrological work has been connected with mountain districts, it has been possible for me to carry on the latter without neglecting the former, and my study of ice-work gradually led me from the highlands into the lowlands.[2] I purpose, then, to ask your attention this evening to some aspects of the glacial history of Western Europe.

At no very distant geological epoch the climate in the northern part of the earth was much colder than it is at present. So it was also in the southern; but whether the two were contemporaneous is less certain. Still more doubtful are the extent and the work of the ice which was a consequence, and the origin of certain deposits on some northern lowlands, including those of our own islands: namely, whether they are the direct leavings of glaciers or were laid down beneath the sea by floating shore-ice and bergs. Much light will be thrown on this complex problem by endeavouring to ascertain what snow and ice have done in some region which, during the Glacial Epoch, was never submerged, and none better can be found for this purpose than the European Alps.

At the present day one school of geologists, which of late years has rapidly increased in number, claims for glaciers a very large share in the sculpture of that chain, asserting that they have not only scooped out the marginal lakes, as Sir A. Ramsay maintained full half a century ago, but have also quarried lofty cliffs, excavated great cirques, and deepened parts of the larger Alpine valleys by something like 2000 feet. The other school, while admitting that a glacier, under special circumstances, may hollow out a tarn or small lake and modify the features of rock scenery, declares that its action is abrasive rather than erosive, and that the sculpture of ridges, crags, and valleys was mainly accomplished in pre-glacial times by running water and the ordinary atmospheric agencies.

In all controversies, as time goes on, hypotheses are apt to masquerade as facts, so that I shall endeavour this evening to disentangle the two, and call attention to those which may be safely used in drawing a conclusion.

In certain mountain regions, especially those where strong lime-

[1] *The Natural History of Igneous Rocks* (1909).

[2] May I add that hereafter a statement of facts without mention of an authority means that I am speaking from personal knowledge.

stones, granites, and other massive rocks are dominant, the valleys are often trench-like, with precipitous sides, having cirques or corries at their heads, and with rather wide and gently sloping floors, which occasionally descend in steps, the distance between these increasing with that from the watershed. Glaciers have unquestionably occupied many of these valleys, but of late years they have been supposed to have taken a large share in excavating them. In order to appreciate their action we must imagine the glens to be filled up and the district restored to its former condition of a more or less undulating upland. As the mean temperature[1] declined snow would begin to accumulate in inequalities on the upper slopes. This, by melting and freezing, would soften and corrode the underlying material, which would then be removed by rain and wind, gravitation and avalanche. In course of time the hollow thus formed would assume more and more the outlines of a corrie or a cirque by eating into the hillside. With an increasing diameter it would be occupied, as the temperature fell, first by a permanent snowfield, then by the *névé* of a glacier. Another process now becomes important, that called "sapping." While ordinary glacier-scour tends, as we are told, to produce "sweeping curves and eventually a graded slope," "sapping" produces "benches and cliffs, its action being horizontal and backwards," and often dominant over scour. The author of this hypothesis[2] convinced himself of its truth in the Sierra Nevada by descending a *bergschrund* 150 feet in depth, which opened out, as is so common, beneath the walls of a cirque. Beginning in the *névé*, it ultimately reached the cliff, so that for the last 30 feet the bold investigator found rock on the one hand and ice on the other. The former was traversed by fracture planes, and was in all stages of displacement and dislodgment; some blocks had fallen to the bottom, others bridged the chasm, while others were frozen in the *névé*. Clear ice had formed in the fissures of the cliff; it hung down in great stalactites; it had accumulated in stalagmitic masses on the floor. Beneath the *névé* the temperature would be uniform, so its action would be protective, except where it set up another kind of erosion, presently to be noticed; but in the chasm, we are informed, there would be, at any rate for a considerable part of the year, a daily alternation of freezing and thawing. Thus the cliff would be rapidly undermined and be carried back into the mountain slope, so that before long the glacier would nestle in a shelter of its own making. Farther down the valley the moving ice would become more effective than sub-glacial streams in deepening its bed; but since the *névé*-flow is almost imperceptible near the head, another agency must be invoked, that of "plucking." The ice grips, like a forceps, any loose or projecting fragment in its rocky bed, wrenches that from its place, and carries it away. The extraction of one tooth weakens the hold of its neighbours, and thus the glen is deepened by "plucking," while it is carried back by "sapping." Streams from melting snows on the slopes

[1] In the remainder of this Address "temperature" is to be understood as in an ice-temperature. The Fahrenheit scale is used.

[2] W. D. Johnson, *Science*, N.S., ix. (1899), pp. 106, 112.

above the amphitheatre might have been expected to co-operate vigorously in making it, but of them little account seems to be taken, and we are even told that in some cases the winds probably prevented snow from resting on the rounded surface between two cirque-heads.[1] As these receded, only a narrow neck would be left between them, which would be ultimately cut down into a gap or "col." Thus a region of deep valleys with precipitous sides and heads, of sharp ridges, and of more or less isolated peaks is substituted for a rather monotonous, if lofty, highland.

The hypothesis is ingenious, but some students of Alpine scenery think more proof desirable before they can accept it as an axiom. For instance, continuous observations are necessary to justify the assumption of diurnal variations of temperature sufficient to produce any sensible effect on rock at the bottom of a narrow chasm nearly 50 yards deep and almost enclosed by ice. Here the conditions would more probably resemble those in a *glacière*, or natural ice cave. In one of these, during the summer, curtains and festoons of ice depend from the walls; from them and from the roof water drips slowly, to be frozen into stalagmitic mounds on the floor, which is itself sometimes a thick bed of ice. On this the quantity of fallen rock *débris* is not greater than is usual in a cave, nor are the walls notably shattered, even though a gap some 4 yards deep may separate them from the ice. The floors of cirques, from which the *névé* has vanished, cannot as a rule be examined, because they are masked by *débris* which is brought down by the numerous cascades, little and big, which seam their walls: but glimpses of them may sometimes be obtained in the smaller corries (which would be cirques if they could), and these show no signs of either "sapping" or "plucking," but some little of abrasion by moving ice. Cirques and corries also not infrequently occur on the sides as well as at the heads of valleys; such, for instance, as the two in the *massif* of the Uri Rothstock on the way to the Surenen Pass and the Fer à Cheval above Sixt. The Lago di Ritom lies between the mouth of a hanging valley and a well-defined step, and just above that is the Lago di Cadagno in a large, steep-walled corrie, which opens laterally into the Val Piora, as that of the Lago di Tremorgio does into the southern side of the Val Bedretto. Cirques may also be found where glaciers have had a comparatively brief existence, as the Creux des Vents on the Jura; or have never been formed, as on the slopes of Salina, one of the Lipari Islands, or in the limestone desert of Lower Egypt.[2] I have seen a miniature stepped valley carved by a rainstorm on a slope of Hampstead Heath; a cirque, about a yard in height and breadth, similarly excavated in the vertical wall of a gravel pit; and a corrie, measured by feet instead of furlongs, at the foot of one of the Binns near Burntisland, or, on a much reduced scale, in a bank of earth. On all these the same agent, plunging water, has left its marks—runlets of rain for the smaller, streams for the larger; convergent at first, perhaps, by accident, afterwards inevitably combined as

[1] This does not appear to have occurred in the Alps.

[2] A. J. Jukes-Browne, *Geol. Mag.*, 1877, p. 477.

the hollow widened and deepened. Each of the great cirques is still a "land of streams," and they are kept permanent for the greater part of the year by beds of snow on the ledges above its walls.

The "sapping and plucking" process presents another difficulty—the steps already mentioned in the floors of valleys. These are supposed to indicate stages at which the excavating glacier transferred its operations to a higher level. But, if so, the outermost one must be the oldest, or the glacier must have been first formed in the lowest part of the incipient valley. Yet, with a falling temperature, the reverse would happen, for otherwise the snow must act as a protective mantle to the mature pre-glacial surface almost down to its base. However much age might have smoothed away youthful angularities, it would be strange if no receptacles had been left higher up to initiate the process; and even if sapping had only modified the form of an older valley, it could not have cut the steps unless it had begun its work on the lowest one. Thus, in the case of the Creux de Champ, if we hesitate to assume that the sapping process began at the mouth of the valley of the Grande Eau above Aigle, we must suppose it to have started somewhere near Ormont Dessus and to have excavated that gigantic hollow, the floor of which lies full 6000 feet below the culminating crags of the Diablerets.

But even if "sapping and plucking" were assigned a comparatively unimportant position in the cutting out of cirques and corries, it might still be maintained that the glaciers of the Ice Age had greatly deepened the valleys of mountain regions. That view is adopted by Professors Penck and Brückner in their work on the glaciation of the Alps,[1] the value of which even those who cannot accept some of their conclusions will thankfully admit. On one point all parties agree—that a valley cut by a fairly rapid stream in a durable rock is V-like in section. With an increase of speed the walls become more vertical; with a diminution the valley widens and has a flatter bed, over which the river, as the base-line is approached, may at last meander. Lateral streams will plough into the slopes, and may be numerous enough to convert them into alternating ridges and furrows. If a valley has been excavated in thick horizontal beds of rock varying in hardness, such as limestones and shales, its sides exhibit a succession of terrace walls and shelving banks, while a marked dip and other dominant structures produce their own modifications. It is also agreed that a valley excavated or greatly enlarged by a glacier should be U-like in section. But an Alpine valley, especially as we approach its head, very commonly takes the following form. For some hundreds of feet up from the torrent it is a distinct V; above this the slopes become less rapid, changing, say, from 45° to not more than 30°, and that rather suddenly. Still higher comes a region of stone-strewn upland valleys and rugged crags, terminating in ridges and peaks of splintered rock, projecting from a mantle of ice and snow. The V-like part is often from 800 to 1000 feet in depth, and the above-named authors maintain that this, with perhaps as much of the more open trough above, was excavated during the Glacial Epoch. Thus the floor

[1] *Die Alpen im Eiszeitalter* (1882).

of any one of these valleys prior to the Ice Age must often have been at least 1800 feet above its present level.[1] As a rough estimate we may fix the deepening of one of the larger Pennine valleys, tributary to the Rhone, to have been, during the Ice Age, at least 1600 feet in their lower parts. Most of them are now hanging valleys; the stream issuing, on the level of the main river, from a deep gorge. Their tributaries are rather variable in form; the larger as a rule being more or less V-shaped: the shorter, and especially the smaller, corresponding more with the upper part of the larger valleys: but their lips generally are less deeply notched. Whatever may have been the cause, this rapid change in slope must indicate a corresponding change of action in the erosive agent. Here and there the apex of the V may be slightly flattened, but any approach to a real U is extremely rare. The retention of the more open form in many small, elevated recesses, from which at the present day but little water descends, suggests that where one of them soon became buried under snow,[2] but was insignificant as a feeder of a glacier, erosion has been for ages almost at a standstill.

The V-like lower portion in the section of one of the principal valleys, which is all that some other observers have claimed for the work of a glacier, cannot be ascribed to subsequent modification by water, because ice-worn rock can be seen in many places, not only high up its sides, but also down to within a yard or two of the present torrent.

Thus valley after valley in the Alps seems to leave no escape from the following dilemma: Either a valley cut by a glacier does not differ in form from one made by running water, or one which has been excavated by the latter, if subsequently occupied, is but superficially modified by ice. This, as we can repeatedly see in the higher Alpine valleys, has not succeeded in obliterating the physical features due to the ordinary processes of erosion. Even where its effects are most striking, as in the Spitallamm below the Grimsel Hospice, it has not wholly effaced those features: and wherever a glacier in a recent retreat has exposed a rock surface, that demonstrates its inefficiency as a plough. The evidence of such cases has been pronounced inadmissible, on the ground that the glaciers of the Alps have now degenerated into senile impotence; but in valley beds over which they passed when in the full tide of their strength the flanks show remnants of rocky ridges only partly smoothed away, and rough rock exists on the "lee-sides" of ice-worn mounds which no imaginary plucking can explain. The ice seems to have flowed over rather than to have plunged into the obstacles in its path, and even the huge steps of limestone exposed by the last retreat of the Unter Grindelwald Glacier have suffered little more than a rounding off of their angles, though that glacier must have passed over them when in fullest

[1] The amount varies in different valleys; for instance, it was fully 2880 feet at Amsteg on the Reuss, just over 2000 feet at Brieg in the Rhone Valley, about 1000 feet at Guttanen in the Aar Valley, about 1550 feet above Zermatt, and 1100 feet above Saas Grund.

[2] My own studies of mountain districts have led me to infer that on slopes of low grade the action of snow is preservative rather than destructive. That conclusion was confirmed by Professor Garwood in a communication to the Royal Geographical Society on June 20 of the present year (see *The Geographical Journal*, Sep. 1910).

development, for it seems impossible to explain these by any process of sapping.

The comparatively level trough, which so often forms the uppermost part of one of the great passes across the watershed of the Alps, can hardly be explained without admitting that in each case the original watershed has been destroyed by the more rapid recession of the head of the southern valley, and this work bears every sign of having been accomplished in pre-glacial times. Sapping and plucking must have operated on a gigantic scale to separate the Viso from the Cottian watershed, to isolate the huge pyramid of the Matterhorn, with its western spur, or to make, by the recession of the Val Macugnaga, that great gap between the Strahlhorn and Monte Rosa. Some sceptics even go so far as to doubt whether the dominant forms of a non-glaciated region differ very materially from those of one which has been half-buried in snowfields and glaciers. To my eyes, the general outlines of the mountains about the Lake of Gennesaret and the northern part of the Dead Sea recalled those around the Lake of Annecy and on the south-eastern shore of Leman. The sandstone crags, which rise here and there like ruined castles from the lower plateau of the Saxon Switzerland, resembled in outlines, though on a smaller scale, some of the Dolomites in the Southern Tyrol. The Lofoten Islands illustrate a half-drowned mountain range from which the glaciers have disappeared. Those were born among splintered peaks and ridges, which, though less lofty, rival in form the Aiguilles of Chamonix, and the valleys become more and more ice-worn as they descend, till the coast is fringed with skerries, every one of which is a *roche moutonnée*. The *névé* in each of these valleys has been comparatively ineffective: the ice has gathered strength with the growth of the glacier. As can be seen from photographs, the scenery of the heart of the Caucasus or of the Himalayas differs in scale rather than in kind from that of the Alps. Thus the amount of abrasion varies, other things being equal, with the latitude. The grinding away of ridges and spurs, the smoothing of the walls of troughs,[1] is greater in Norway than in the Alps; it is still greater in Greenland than in Norway, and it is greatest of all in the Antarctic, according to the reports of the expeditions led by Scott and Shackleton. But even in Polar regions, under the most favourable conditions, the dominant outlines of the mountains, as shown in the numerous photographs taken by both parties, and in Dr. Wilson's admirable drawings, differ in degree rather than in kind from those of mid-European ranges. It has been asserted that the parallel sides of the larger Alpine valleys—such as the Rhone above Martigny, the Lütschine near Lauterbrunnen, and the Val Bedretto below Airolo—prove that they have been made by the ice-plough rather than by running water; but in the first I am unable to discern more than the normal effects of a rather rapid river which has followed a trough of comparatively soft rocks; in the second, only the cliffs marking the channel cut by a similar stream through massive limestones—

[1] If one may judge from photographs, the smoothing of the sides of a valley is unusually conspicuous in Milton Sound, New Zealand.

cliffs like those which elsewhere rise up the mountain flanks far above the levels reached by glaciers; while in the third I have failed to discover, after repeated examination, anything abnormal.

Many lake basins have been ascribed to the erosive action of glaciers. Since the late Sir A. Ramsay advanced this hypothesis numbers of lakes in various countries have been carefully investigated and the results published, the most recent of which is the splendid work on the Scottish lochs by Sir J. Murray and Mr. L. Pullar.[1] A contribution to science of the highest value, it has also a deeply pathetic interest, for it is a father's memorial to a much-loved son, F. P. Pullar, who, after taking a most active part in beginning the investigation, lost his life while saving others from drowning. As the time at my command is limited, and many are acquainted with the literature of the subject, I may be excused from saying more than that even these latest researches have not driven me from the position which I have maintained from the first—namely, that while many tarns in corries and lakelets in other favourable situations are probably due to excavation by ice, as in the mountainous districts of Britain, in Scandinavia, or in the higher parts of the Alps, the difficulty of invoking this agency increases with the size of the basin—as, for example, in the case of Loch Maree or the Lake of Annecy—till it becomes insuperable. Even if Glas Llyn and Llyn Llydaw were the work of a glacier, the rock basins of Gennesaret and the Dead Sea, still more those of the great lakes in North America and in Central Africa, must be assigned to other causes.

I pass on, therefore, to mention another difficulty in this hypothesis —that the Alpine valleys were greatly deepened during the Glacial Epoch —which has not yet, I think, received sufficient attention. From three to four hundred thousand years have elapsed, according to Penck and Brückner, since the first great advance of the Alpine ice. One of the latest estimates of the thickness of the several geological formations assigns 4000 feet[2] to the Pleistocene and Recent, 13,000 to the Pliocene, and 14,000 to the Miocene. If we assume the times of deposit to be proportional to the thicknesses, and adopt the larger figure for the first-named period, the duration of the Pliocene would be 1,300,000 years, and of the Miocene 1,400,000 years. To estimate the total vertical thickness of rock which has been removed from the Alps by denudation is far from easy, but I think 14,000 feet would be a liberal allowance, of which about one-seventh is assigned to the Ice Age. But during that age, according to a curve given by Penck and Brückner, the temperature was below its present amount for rather less than half (·47) the time. Hence it follows that, since the sculpture of the Alps must have begun at least as far back as the Miocene period, one-seventh of the work has been done by ice in not quite one-fifteenth of the time, or its action must be very potent. Such data as are at our command make it probable that a Norway glacier at the present day lowers its basin by only about eighty

[1] *Bathymetrical Survey of the Scottish Freshwater Lochs*. Sir J. Murray and Mr. L. Pullar, 1910.

[2] I have doubts whether this is not too great.

millimètres in 1000 years: a Greenland glacier may remove some 121 millimètres in the same time, while the Vatnajökul in Iceland attains to 647 millimètres. If Alpine glaciers had been as effective as the last-named, they would not have removed, during their 188,000 years of occupation of the Alpine valleys, more than 121·6 metres, or just over 397 feet; and as this is not half the amount demanded by the more moderate advocates of erosion, we must either ascribe an abnormal activity to the vanished Alpine glaciers, or admit that water was much more effective as an excavator.

We must not forget that glaciers cannot have been important agents in the sculpture of the Alps during more than part of Pleistocene times. That sculpture probably began in the Oligocene period; for rather early in the next one the great masses of conglomerate, called *Nagelfluh*, show that powerful rivers had already carved for themselves valleys corresponding generally with and nearly as deep as those still in existence. Temperature during much of the Miocene period was not less than 12° F. above its present average. This would place the snow-line at about 12,000 feet.[1] In that case, if we assume the altitudes unchanged, not a snowfield would be left between the Simplon and the Maloja, the glaciers of the Pennines would shrivel into insignificance, Monte Rosa would exchange its drapery of ice for little more than a tippet of frozen snow. As the temperature fell the white robes would steal down the mountain-sides, the glaciers grow, the torrents be swollen during all the warmer months, and the work of sculpture increase in activity. Yet with a temperature even 6° higher than it now is, as it might well be at the beginning of the Pliocene period, the snow-line would be at 10,000 feet; numbers of glaciers would have disappeared, and those around the Jungfrau and the Finsteraarhorn would be hardly more important than they now are in the Western Oberland.

But denudation would begin so soon as the ground rose above the sea. Water, which cannot run off the sand exposed by the retreating tide without carving a miniature system of valleys, would never leave the nascent range intact. The Miocene Alps, even before a patch of snow could remain through the summer months, would be carved into glens and valleys. Towards the end of that period the Alps were affected by a new set of movements, which produced their most marked effects in the northern zone from the Inn to the Durance. The Oberland rose to greater importance: Mont Blanc attained its primacy: the *massif* of Dauphiné was probably developed. That, and still more the falling temperature, would increase the snowfields, glaciers, and torrents. The first would be, in the main, protective; the second, locally abrasive; the third, for the greater part of their course, erosive. No sooner had the drainage system been developed on both sides of the Alps than the valleys on the Italian side (unless we assume a very different distribution

[1] I take the fall of temperature for a rise in altitude as 1° F. for 300 feet or, when the differences in the latter are large, 3° per 1000 feet. These estimates will, I think, be sufficiently accurate. The figures given by Hann (see for a discussion of the question, *Report of Brit. Assoc.*, 1909, p. 93) work out to 1° F. for each 318 feet of ascent (up to about 10,000 feet).

of rainfall) would work backwards more rapidly than those on the northern. Cases of trespass, such as that recorded by the long level trough on the north side of the Maloja Kulm and the precipitous descent on the southern, would become frequent. In the interglacial episodes—three in number, according to Penck and Brückner, and occupying rather more than half the epoch—the snow and ice would dwindle to something like its present amount, so that the water would resume its work. Thus I think it far more probable that the V-like portions of the Alpine valleys were in the main excavated during Pliocene ages, their upper and more open parts being largely the results of Miocene and yet earlier sculpture.

During the great advances of the ice, four in number, according to Penck and Brückner,[1] when the Rhone glacier covered the lowlands of Vaud and Geneva, welling on one occasion over the gaps in the Jura, and leaving its erratics in the neighbourhood of Lyons, it ought to have given signs of its erosive no less than of its transporting power. But what are the facts? In these lowlands we can see where the ice has passed over the Molasse (a Miocene sandstone); but here, instead of having crushed, torn, and uprooted the comparatively soft rock, it has produced hardly any effect. The huge glacier from the Linth Valley crept for not a few miles over a floor of stratified gravels, on which, some eight miles below Zurich, one of its moraines, formed during the last retreat, can be seen resting, without having produced more than a slight superficial disturbance. We are asked to credit glaciers with the erosion of deep valleys and the excavation of great lakes, and yet, wherever we pass from hypothesis to facts, we find them to have been singularly inefficient workmen!

I have dwelt at considerable, some may think undue, length on the Alps, because we are sure that this region from before the close of the Miocene period has been above the sea-level. It accordingly demonstrates what effects ice can produce when working on land.

In America also, to which I must now make only a passing reference, great ice-sheets formerly existed: one occupying the district west of the Rocky Mountains, another spreading from that on the north-west of Hudson's Bay, and a third from the Laurentian hill-country. These two became confluent, and their united ice-flow covered the region of the Great Lakes, halting near the eastern coast a little south of New York, but in Ohio, Indiana, and Illinois occasionally leaving moraines only a little north of the 39th parallel of latitude.[2] Of these relics my first-hand knowledge is very small, but the admirably illustrated reports and other writings of American geologists[3] indicate that, if we make due

[1] On the exact number I have not had the opportunity of forming an opinion.

[2] Some of the glacial drifts on the eastern side of the continent, as we shall find, may have been deposited in the sea.

[3] See the *Reports of the United States Geological Survey* (from vol. iii. onwards), *Journal of Geology*, *American Journal of Science*, and local publications too numerous to mention. Among these the studies in Greenland by Professor Chamberlin are especially valuable for the light they throw on the movement of large glaciers and the transport of *débris* in the lower part of the ice.

allowance for the differences in environment, the tills and associated deposits on their continent are similar in character to those of the Alps.[1]

In our own country and in corresponding parts of Northern Europe we must take into account the possible co-operation of the sea. In these, however, geologists agree that, for at least a portion of the Ice Age, glaciers occupied the mountain districts. Here ice-worn rocks, moraines and perched blocks, tarns in corries, and perhaps lakelets in valleys, demonstrate the former presence of a mantle of snow and ice. Glaciers radiated outwards from more than one focus in Ireland, Scotland, the English Lake District, and Wales, and trespassed, at the time of their greatest development, upon the adjacent lowlands. They are generally believed to have advanced and retreated more than once, and their movements have been correlated by Professor J. Geikie with those already mentioned in the Alps. Into that very difficult question I must not enter; for my present purpose it is enough to say that in early Pleistocene times glaciers undoubtedly existed in the mountain districts of Britain and even formed piedmont ice-sheets on the lowlands. On the west side of England, smoothed and striated rocks have been observed near Liverpool, which can hardly be due to the movements of shore-ice, and at Little Crosby a considerable surface has been cleared from the overlying boulder clay by the exertions of the late Mr. T. M. Reade and his son, Mr. A. Lyell Reade. But, so far as I am aware, rocks thus affected have not yet been discovered in the Wirral peninsula. On the eastern side of England similar markings have been found down to the coast of Durham, but a more southern extension of land ice cannot be taken for granted. In this direction, however, so far as the tidal valley of the Thames, and in corresponding parts of the central and western lowlands, certain deposits occur which, though to a great extent of glacial origin, are in many respects different from those left by land ice in the Alpine regions and in Northern America.

They present us with problems the nature of which may be inferred from a brief statement of the facts. On the Norfolk coast we find the glacial drifts resting, sometimes on the chalk, sometimes on strata of very late Pliocene or early Pleistocene age. The latter show that in their time the strand line must have oscillated slightly on either side of its present level. The earliest of the glacial deposits, called the Cromer Till and Contorted Drift, presents its most remarkable development in the cliffs on either side of that town. Here it consists of boulder clays and alternating beds of sand and clay: the first-named, two or three in number, somewhat limited in extent, and rather lenticular in form, are slightly sandy clays, full of pieces of chalk, flint, and other kinds of rock, some of the last having travelled from long distances. Yet more remarkable are the huge erratics of chalk, in the neighbourhood of which the sands and clays exhibit extraordinary contortions. Like the beds of till, they have not been found very far inland, for there the group

[1] Here, however, we cannot always [illegible] of the absence of the sea.

appears as a whole to be represented by a stony loam, resembling a mixture of the sandy and clayey material, and this is restricted to a zone some twenty miles wide, bordering the coast of Norfolk and Suffolk; not extending south of the latter county, but being probably represented to the north of the Humber. Above these is a group of false-bedded sands and gravels, variable in thickness and character—the Mid-glacial Sands of Searles V. Wood and F. W. Harmer. They extend over a wider area, and may be traced, according to some geologists, nearly to the western side of England, rising in that direction to a greater height above sea-level. But as it is impossible to prove that all isolated patches of these materials are identical in age, we can only be certain that some of them are older than the next deposit, a boulder clay, which extends over a large part of the lowlands in the Eastern Counties. This has a general resemblance to the Cromer Till, but its matrix is rather more clayey and is variable in colour. In and north of Yorkshire, as well as on the seaward side of the Lincolnshire wolds, it is generally brownish or purplish, but on their western side and as far as the clay goes to the south it is some shade of grey. Near to these wolds, in mid-Norfolk, and on the northern margin of Suffolk, it has a whitish tint, owing to the abundance of comminuted chalk. To the south and west of this area it is dark, from the similar presence of Kimeridge clay. Yet further west it assumes an intermediate colour by having drawn upon the Oxford clay. This boulder clay, whether the chalky or the purple, in which partings of sand sometimes occur, must once have covered, according to Mr. F. W. Harmer, an area about ten thousand square miles in extent. It spreads like a coverlet over the pre-glacial irregularities of the surface. It caps the hills, attaining sometimes an elevation of fully 500 feet above sea-level;[1] it fills up valleys,[2] sometimes partly, sometimes wholly, the original floors of which occasionally lie more than 100 feet below the same level. This boulder clay, often with an underlying sand or gravel, extends to the south as far as the neighbourhood of Muswell Hill and Finchley; hence its margin runs westward through Buckinghamshire, and then, bending northwards, passes to the west of Coventry. On this side of the Pennine Chain the matrix of the boulder clay is again reddish, being mainly derived from the sands and marls of the Trias; pieces of chalk and flint are rare (no doubt coming from Antrim), though other rocks are often plentiful enough. Some authorities are of opinion that the drift in most parts of Lancashire and Cheshire is separable, as on the eastern coasts, into a lower and an upper boulder clay, with intervening gravelly sands, but others think that the association of the first and third

[1] Not far from Royston it is found at a height of 525 feet above O.D. See F. W. Harmer, *Pleistocene Period in the Eastern Counties*, p. 115.

[2] At Old North Road Station, on a tributary of the Cam, the boulder clay was pierced to a depth of 180 feet, and at Impington it goes to 60 feet below sea-level. Near Hitchin, a hidden valley, traced for seven or eight miles, was proved to a depth of 68 feet below O.D., and one near Newport in Essex, to 140 feet. Depths were also found of 120 feet at West Horseheath in Suffolk, of 120 feet on low ground two miles S.W. of Sandy in Bedfordshire, of from 100 to 160 feet below the sea at Fossdyke, Long Sutton, and Boston, and at Glemsford in the valley of the Stour, 477 feet of drift was passed through before reaching the chalk. See F. W. Harmer, *Quart. Journ. Geol. Soc.*, lxiii. (1907), p. 494.

is lenticular rather than successive. Here also the lower clay cannot be traced very far inland, eastward or southward; the others have a wider extension, but they reach a greater elevation above sea-level than on the eastern side of England. The sand is inconstant in thickness, being sometimes hardly represented, sometimes as much as 200 feet. The upper clay runs on its more eastern side up to the chalky boulder clay, and extends on the south at least into Worcestershire. On the western side it merges with the upper member of the drifts radiating from the mountains of North Wales, which often exhibit a similar tripartite division, while (as we learn from the officers of the Geological Survey) boulder clays and gravelly sands, which it must suffice to mention, extend from the highlands of South Wales for a considerable distance to the south-east and south. Boulder clay has not been recognised in Devon or Cornwall, though occasional erratics are found which seem to demand some form of ice-transport. A limited deposit, however, of that clay, containing boulders now and then over a yard in diameter, occurs near Selsey Bill on the Sussex coast, which most geologists consider to have been formed by floating rather than by land ice.

Marine shells are not very infrequent in the lower clays of East Anglia and Yorkshire, but are commonly broken. The well-known Bridlington Crag is the most conspicuous instance, but this is explained by many geologists as an erratic—a piece of an ancient North Sea bed caught up and transported, like the other molluscs, by an advancing ice-sheet. They also claim a derivative origin for the organic contents of the overlying sands and gravels, but some authorities consider the majority to be contemporaneous. Near the western coast of England, shells in much the same state of preservation as those on the present shore are far from rare in the lower clay, where they are associated with numerous striated stones, often closely resembling those which have travelled beneath a glacier, both from the Lake District and the less distant Trias. Shells are also found in the overlying sands up the valleys of the Dee and Severn, at occasional localities, even as far inland as Bridgnorth, the heights of the deposits varying from about 120 feet to over 500 feet above the sea-level. If we also take account of the upper boulder clay, where it can be distinguished, the list of marine molluscs, ostracods, and foraminifers from these western drifts is a rather long one.[1]

Marine shells, however, on the western side of England, are not restricted to the lowlands. Three instances, all occurring over 1000 feet above sea-level, claim more than a passing mention. At Macclesfield, almost thirty miles in a straight line from the head of the estuary of the Mersey, boulder clays associated with stratified gravels and sands have been described by several observers.[2] The clay stops at about 1000 feet.

[1] W. Shone, *Quart. Journ. Geol. Soc.*, xxxiv. (1878), p. 887.

[2] *Memoirs of the Geological Survey*: "Country around Macclesfield," T. I. Pocock (1906), p. 35. For some notes on Moel Tryfaen and the altitudes of other localities at which marine organisms have been found see J. Gwyn Jeffreys, *Quart. Journ. Geol. Soc.*, xxxvi. (1880), p. 351. For the occurrence of such remains in the Vale of Clwyd see a paper by T. M'K. Hughes in *Proc. Chester Soc. of Nat. Hist.*, 1884.

but the sands and gravels go on to nearly 1300 feet, while isolated erratics are found up to about 100 feet higher. Sea shells, some of which are in good condition, have been obtained at various elevations, the highest being about 1200 feet above sea-level. About forty-eight species of molluscs have been recognised, and the fauna, with a few exceptions, more arctic in character and now found at a greater depth, is one which at the present day lives in a temperate climate at a depth of a few fathoms.

The shell-bearing gravels at Gloppa, near Oswestry, which are about thirty miles from the head of the Dee estuary, were carefully described in 1892 by Mr. A. C. Nicholson. He has enumerated fully sixty species, of which, however, many are rare. As his collection[1] shows, the bivalves are generally broken, but a fair number of the univalves are tolerably perfect. The deposit itself consists of alternating seams of sand and gravel, the one generally about an inch in thickness, the other varying from a few inches to a foot. The difference in the amount of rounding shown by the stones is a noteworthy feature. They are not seldom striated; some have come from Scotland, others from the Lake District, but the majority from Wales, the last being the more angular. Here and there a block, sometimes exceeding a foot in diameter and usually from the last-named country, has been dropped among the smaller material, most of which ranges in diameter from half an inch to an inch and a half. The beds in one or two places show contortions; but as a rule, though slightly wavy and with a gentle dip rather to the west of south, they are uniformly deposited. In this respect, and in the unequal wearing of the materials, the Gloppa deposit differs from most gravels that I have seen. Its situation also is peculiar. It is on the flattened top of a rocky spur from higher hills, which falls rather steeply to the Shropshire lowland on the eastern side, and on the more western is defined by a small valley which enlarges gradually as it descends towards the Severn. If the country were gradually depressed for nearly 1200 feet, this upland would become, first a promontory, then an island, and finally a shoal.

The third instance, on Moel Tryfaen in Carnarvonshire, was carefully investigated and described by a Committee of this Association[2] about ten years ago. The shells occur in an irregularly stratified sand and gravel, resting on slate, and overlain by a boulder clay, no great distance from and a few dozen feet below the rocky summit of the hill, being about 1300 feet above the level of the sea and at least five miles from its margin. About fifty-five species of molluscs and twenty-three of foraminifers have been identified. According to the late Dr. J. Gwyn Jeffreys,[3] the majority of the molluscs are littoral in habit, the rest such as live in from ten to twenty fathoms of water. Most of the erratics have been derived from the Welsh mountains, but some rocks from Anglesey have also been obtained, and a few pebbles of Lake District

[1] Now deposited in the Oswestry Museum.

[2] *Brit. Assoc. Report*, 1899 (1900), pp. 414-423.

[3] *Quart. Journ. Geol. Soc.*, xxxvi. (1880), p. 355.

and Scotch rocks. If the sea were about 1300 feet above its present level, Moel Tryfaen would become a small rocky island, open to the storms from the west and north, and nearly a mile and a half away from the nearest land.

I must pass more rapidly over Ireland. The signs of vanished glaciers—ice-worn rocks and characteristic boulder-clays—are numerous, and may be traced in places down to the sea-level, but the principal outflow of the ice, according to some competent observers, was from a comparatively low district, extending diagonally across the island from the south of Lough Neagh to north of Galway Bay. Glaciers, however, must have first begun to form in the mountains on the northern and southern side of this zone, and we should have expected that, whatever might happen on the lowlands, they would continue to assert themselves. In no other part of the British Islands are eskers, which some geologists think were formed when a glacier reached the sea, so strikingly developed. Here also an upper and a lower boulder clay, the former being the more sparsely distributed, are often divided by a widespread group of sands and gravels, which locally, as in Great Britain, contains, sometimes abundantly, shells and other marine organisms; more than twenty species of molluscs, with foraminifers, a barnacle, and perforations of annelids, have been described. These are found in counties Dublin and Wicklow, at various altitudes,[1] from a little above sea-level to a height of 1300 feet.

Not the least perplexing of the glacial phenomena in the British Isles is the distribution of erratics, which has been already mentioned in passing. On the Norfolk coast, masses of chalk, often thousands of cubic feet in volume, occur in the lowest member of the glacial series, with occasional great blocks of sand and gravel, which must have once been frozen. But these, or at any rate the larger of them, have no doubt been derived from the immediate neighbourhood. Huge erratics also occasionally occur in the upper boulder clay—sometimes of chalk, as at Roslyn Hill near Ely and at Ridlington in Rutland, of Jurassic limestone, as near Great Ponton, to the south of Grantham, or of Lower Kimeridge clay as near Biggleswade.[2] These also probably have not travelled more than a few miles. But others of smaller size have often made much longer journeys. The boulder clays of eastern England are full of pieces of rock, commonly ranging from about half an inch to a foot in diameter. Among these are samples of the Carboniferous, Jurassic, and Cretaceous rocks of Yorkshire and the adjacent counties: the red chalk from either Hunstanton, Speeton, or some part of the Lincolnshire wolds, being found as far south as the northern heights of London. Even the chalk and flint, the former of which, especially in the upper boulder clay, commonly occurs in well-worn pebbles, are frequently not the local but the northern varieties. With these are mingled specimens from yet more distant sources—Cheviot porphyrites, basalts from South Scotland, even some of the crystalline rocks

[1] See T. M. Reade, *Proc. Liverpool Geol. Soc.*, 1893-94, p. 183, for some weighty arguments in favour of a marine origin for these deposits.

[2] H. Home, *Quart. Journ. Geol. Soc.*, lix. (1903), p. 375.

of the Highlands. Whatever was the transporting agent, its general direction was southerly, with a slight deflection towards the east in the last-named cases.

But the path of these erratics has been crossed by two streams, one coming from the west, the other from the east. On the western side of the Pennine watershed the Shap granite rises at Wasdale Crag to a height of about 1600 feet above sea-level. Boulders from it have descended the Eden valley to beyond Penrith; they have travelled in the opposite direction almost to Lancaster,[1] and a large number of them have actually made their way near the line of the Lake District watershed, across the upper valley of the Eden, and over the high pass of Stainmoor Forest,[2] whence they descended into Upper Teesdale. Subsequently the stream seems to have bifurcated, one part passing straight out to the present sea-bed, by way of the lower course of the Tees, to be afterwards driven back on to the Yorkshire coast. The other part crossed the low watershed between the Tees and the Ouse, descended the Vale of York and spread widely over the plain.[3] Shap boulders by some means penetrated into the valleys tributary to the Ouse on its west bank, and they have been observed as far to the south-east as Royston, near Barnsley. It is noteworthy that Lake District rocks have been occasionally recorded from Airedale and even the neighbourhood of Colne, though the granite from Shap has not been found there. The other stream started from Scandinavia. Erratics, some of which must have come from the north-western side of the Christiania Fjord, occur on or near the coast from Essex to Yorkshire, and occasionally even as far north as Aberdeen, while they have been traced from the East Anglian coast to near Ware, Hitchin, and Bedford.[4] It may be important to notice that these Scandinavian erratics are often waterworn, like those dispersed over Denmark and parts of Northern Germany.

On the western side of England the course of erratics is not less remarkable. Boulders from South-Western Scotland, especially from the Kirkcudbright district, both waterworn and angular, are scattered over the lowlands as far south as Wolverhampton, Bridgnorth, and Church Stretton. They may be traced along the border of North Wales, occurring, as has been said, though generally small, up to about 1300 feet on Moel Tryfaen, 1100 feet at Gloppa, and more than that height on the hills east of Macclesfield. Boulders from the Lake District are scattered over much the same area and attain the same elevation, but extend, as might be expected, rather farther to the east in Lancashire. They also have been found on the eastern side of the Pennine watershed, perhaps the most remarkable instances being in the dales of the Derbyshire Derwent and on the adjacent hills as much as 1400 feet above the sea-level.[5] A third remarkable stream of erratics from the neighbour-

[1] A pebble of it is said to have been identified at Moel Tryfaen.

[2] The lowest part of the gap is about 1400 feet. A little to the south is another gap about 200 feet lower, but none of the boulders seem to have taken that route.

[3] A boulder was even found above Grosmont in the Eske valley, 345 feet above sea-level.

[4] R. H. Rastall and J. Romanes, *Quart. Journ. Geol. Soc.*, lxv. (1909), p. 246.

[5] Communication from Dr. H. Arnold-Bemrose.

hood of the Arenig mountains extends from near the estuary of the Dee right across the paths of the two streams from the north, its eastern border passing near Rugeley, Birmingham, and Bromsgrove. They also range high, occurring almost 900 feet above sea-level on Romsley Hill, north of the Clents, and being common at Gloppa. Boulders also from the basalt mass of Rowley Regis have travelled in some cases between four and five miles, and in directions ranging from rather west of south to north-east; and, though that mass hardly rises above the 700 feet contour line, one lies with an Arenig boulder on Romsley Hill. From Charnwood Forest, the crags of which range up to about 850 feet above sea-level, boulders have started which have been traced over an area to the south and west to a distance of more than twenty miles.

Such, then, are the facts, which call for an interpretation. More than one has been proposed; but it will be well, before discussing them, to arrive at some idea of the climate of these islands during the colder part of the Glacial Epoch. Unless that were associated with very great changes in the distribution of sea and land in Northern and North-Western Europe, we may assume that neither the relative position of the isotherms nor the distribution of precipitation would be very materially altered. A general fall of temperature in the northern hemisphere might so weaken the warmer ocean current from the south-west that our coasts might be approached by a cold one from the opposite direction.[1] But though these changes might diminish the difference between the temperatures of London and Leipzig, they would not make the former colder than the latter. At the present day the snow-line in the Alps on either side of the Upper Rhone Valley is not far from 8000 feet above sea-level, and this corresponds with a temperature of about 30°. Glaciers, however, are not generally formed till about 1000 feet higher, where the temperature is approximately 27°. Penck and Brückner place this line during the coldest part of the Ice Age at about 4000 feet.[2] In that case the temperature of the Swiss lowland would be some 15° lower than now, or near the freezing point.[3] If this fall were general, it would bring back the small glaciers on the Gran Sasso d'Italia and Monte Rotondo in Corsica; perhaps also among the higher parts of the Vosges and Schwarzwald.[4] In our own country it would give a temperature of about 35° at Carnarvon, and 23° on the top of Snowdon, of 32° at Fort William, and 17·5° on the top of Ben Nevis. If, in addition to this, the land were 600 feet higher than now (as it probably was, at any rate in the beginning of the Glacial Epoch), there

[1] Facts relating to this subject will be found in *Climate and Time*, by J. Croll, ch. ii. and iii. (1875). Of course the air currents would also be affected, and perhaps diminish precipitation as the latitude increased.

[2] *Loc. cit.* p. 586 *et seq.* They say the snow-line was [illegible] the temperature was only 12° lower than now; but as possibly this line might then more nearly correspond with that of glacier formation, I will provisionally accept the higher figures, especially since Corsica, the Apennines, and some other localities in Europe, seem to require a reduction of rather more than 12°.

[3] It would be 32·5° at Zurich, 31·6° at Bern, 34·1° at Geneva, about 39·0° on the plain of Piedmont, and 36·0° at Lyons.

[4] See for particulars the author's *Ice Work* ("International Scientific Series"), p. 237.

would be a further drop of 2 , so that glaciers would form in the corries of Snowdon, and the region round Ben Nevis might resemble the Oetzthal Alps at the present day. This change of itself would be insufficient, and any larger drop in the ocean-level would have to be continental in its effects, since we cannot assume a local upheaval of much more than the above amount without seriously interfering with the river system of North Central Europe. But these changes, especially the former, might indirectly diminish the abnormal warmth of winter on our north-western coasts.[1] It is difficult to estimate the effect of this. If it did no more than place Carnarvon on the isotherm of Berlin (now lower by 2°), that would hardly bring a glacier from the Snowdonian region down to the sea. At the present time London is about 18° warmer than a place in the same latitude near the Labrador coast or the mouth of the Amur River, but the removal of that difference would involve greater changes in the distribution of sea and land than seems possible at an epoch comparatively speaking so recent. I am doubtful whether we can attribute to changed currents a reduction in British temperatures of so much as 11°; but, if we did, this would amount to 28° from all causes, and give a temperature of 20° to 22° at sea-level in England, during the coldest part of the Glacial Epoch.[2] That is now found, roughly speaking, in Spitzbergen, which, since its mountains rise to much the same height, should give us a general idea of the condition of Britain in the olden time.

What would then be the state of Scandinavia? Its present temperature ranges on the west coast from about 45° in the south to 35° in the north.[3] But this region must now be very much, possibly 1800 feet, lower than it was in pre-glacial, perhaps also in part of glacial, times.[4] If we added 5° for this to the original 15°, and allowed so much as 18° for the diversion of the warm current, the temperature of Scandinavia would range from 7° to −3°, approximately that of Greenland northwards from Upernivik. But since the difference at the present day between Cape Farewell and Christiania (the one in an abnormally cold region, the other in one correspondingly warm) is only 7°, that allowance seems much too large, while without it Scandinavia would correspond in temperature with some part of that country from south of Upernivik to north of Frederikshaab.[5] But if Christiania were not colder than Jakobshavn is now, or Britain than Spitzbergen, we are

[1] For much valuable information on these questions see a paper on the "Climate of the Pleistocene Epoch" (F. W. Harmer, *Quart. Journ. Geo. Soc.*, lvii. (1901), p. 405).

[2] The present temperature in Ireland over the zone (from S. of Belfast to N. of Galway Bay), which is supposed to have formed the divide of the central snowfield, may be given as from 49° to 50°, nearly the same as at the sea-level in Carnarvonshire. Thus, though the district is less mountainous than Wales, it would not need a greater reduction, for the snowfall would probably be rather larger. But this reduction could hardly be less than 20°, for the glaciers would have to form nearly at the present sea-level.

[3] It is 41·42 at Bergen, 38·48 at Bodo, 35·42 at Hammerfest, 41·36 at Christiania and Stockholm.

[4] For particulars see *Geol. Mag.*, 1899, p. 97 (W. H. Hudleston), and p. 282 (T. G. Bonney).

[5] Christiania and Cape Farewell (Greenland) are nearly on the same latitude.

precluded from comparisons with the coasts of Baffin Bay or Victoria Land.

Thus the ice-sheet from Scandinavia would probably be much greater than those generated in Britain. It would, however, find an obstacle to progress westwards, which cannot be ignored. If the bed of the North Sea became dry land, owing to a general rise of 600 feet, that would still be separated from Norway by a deep channel, extending from the Christiania Fjord round the coast northward. Even then this would be everywhere more than another 600 feet deep, and almost as wide as the Strait of Dover.[1] The ice must cross this and afterwards be forced for more than 300 miles up a slope, which, though gentle, would be in vertical height at least 600 feet. The task, if accomplished by thrust from behind, would be a heavy one, and, so far as I know, without a parallel at the present day; if the viscosity of the ice enabled it to flow, as has lately been urged,[2] we must be cautious in appealing to the great Antarctic barrier, because we now learn that more than half of it is only consolidated snow.[3] Moreover, if the ice floated across that channel, the thickness of the boulder-bearing layers would be diminished by melting (as in Ross's Barrier), and the more viscous the material, the greater the tendency for these to be left behind by the overflow of the cleaner upper layers. If, however, the whole region became dry land, the Scandinavian glaciers would descend into a broad valley, considerably more than 1200 feet deep, which would afford them an easy path to the Arctic Ocean, so that only a lateral overflow, inconsiderable in volume, could spread itself over the western plateau.[4] An attempt to escape this difficulty has been made by assuming the existence of an independent centre of distribution for ice and boulders near the middle of the North Sea bed[5] (which would demand rather exceptional conditions of temperature and precipitation); but in such case either the Scandinavian ice would be fended off from England, or the boulders, prior to its advance, must have been dropped by floating ice on the neighbouring sea-floor.

If, then, our own country were but little better than Spitzbergen as a producer of ice, and Scandinavia only surpassed Southern Greenland in having a rather heavier snowfall, what interpretation may we give to the glacial phenomena of Britain? Three have been proposed. One asserts that throughout the Glacial Epoch the British Isles generally stood at a higher level, so that the ice which almost buried them flowed out on to the beds of the North and Irish Seas. The boulder clays represent its moraines. The stratified sands and gravels were

[1] For details see *Geol. Mag.*, 1899, pp. 97 and 282.

[2] H. M. Deeley, *Geol. Mag.*, 1909, p. 239.

[3] E. Shackleton, *The Heart of the Antarctic*, ii. 277.

[4] It has indeed been affirmed (Brögger, *Om desenglaciale og postglaciale nivaforandringer i Kristianiafelted*, p. 682) that at the time of the great ice-sheet of Europe the sea-bottom must have been uplifted at least 8500 feet higher than at present. This may be a ready explanation of the occurrence of certain dead shells in deep water, but, unless extremely local, it would revolutionise the drainage system of Central Europe.

[5] *Geol. Mag.*, 1901, pp. 142, 187, 284, 332.

deposited in lakes formed by the rivers which were dammed up by ice-sheets.[1] A second interpretation recognises the presence of glaciers in the mountain regions, but maintains that the land, at the outset rather above its present level, gradually sank beneath the sea, till the depth of water over the eastern coast of England was fully 500 feet, and over the western nearly 1400 feet, from which depression it slowly recovered. By any such submergence Great Britain and Ireland would be broken up into a cluster of hilly islands, between which the tide from an extended Atlantic would sweep eastwards twice a day, its currents running strong through the narrower sounds, while movements in the reverse direction at the ebb would be much less vigorous. The third interpretation, in some respects intermediate, was first advanced by the late Professor Carvill Lewis, who held that the peculiar boulder clays and associated sands (such as those of East Anglia), which, as was then thought, were not found more than about 450 feet above the present sea-level, had been deposited in a great fresh-water lake, held up by the ice-sheets already mentioned and by an isthmus, which at that time occupied the place of the Strait of Dover. Thus, these deposits, though indirectly due to land-ice, were actually fluviatile or lacustrine. But this interpretation need not detain us, though the former existence of such lakes is still maintained, on a small scale in Britain, on a much larger one in North America, because, as was pointed out when it was first advanced, it fails to explain the numerous erratic blocks and shell-bearing sands which occur far above the margin of the hypothetical lake.

Each of the other two hypotheses involves grave difficulties. That of great confluent ice-sheets creeping over the British lowlands demands, as has been intimated, climatal conditions which are scarcely possible, and makes it hard to explain the sands and gravels, sometimes with regular alternate bedding, but more generally indicative of strong current action, which occur at various elevations to over 1300 feet above sea-level, and seem too widespread to have been formed either beneath an ice-sheet or in lakes held up by one; for the latter, if of any size, would speedily check the velocity of influent streams. Also the mixture and crossing of boulders, which we have described, are inexplicable without the most extraordinary oscillations in the size of the contributing glaciers. To suppose that the Scandinavian ice reached to Bedfordshire and Herts, and then retired in favour of North British glaciers, or *vice versâ*, assumes an amount of variation which, so far as I am aware, is without a parallel elsewhere. So also the mixture of boulders from South Scotland, the Lake District, and North Wales which lie, especially in parts of Staffordshire and Shropshire, as if dropped upon the surface, far exceeds what may reasonably be attributed to variations amplified by lateral spreading of mountain glaciers on reaching a lowland, while the frequent presence of shells in the drifts, dozens of

[1] See Warren Upham, *Memoir. U.S. Geol. Survey*, xxv. (1896). This explanation commends itself to the majority of British geologists as an explanation of the noted parallel roads of Glenroy, but it is premature to speak of it as "conclusively shown" (*Quart. Journ. Geol. Soc.*, lviii. (1902), 473) until a fundamental difficulty which it presents has been discussed and removed.

miles away from the present coast, implies a rather improbable scooping up of the sea-bed without much injury to such fragile objects. The ice also must have been curiously inconstant in its operations. It is supposed in one place to have glided gently over its bed, in another to have gripped and torn out huge masses of rock.[1] Both actions may be possible in a mountain region, but it is very difficult to understand how they could occur in a lowland or plain. Besides this we can only account for some singular aberrations of boulders, such as Shap granite well above Grosmont in Eskdale, or the Scandinavian rhomb-porphyry above Lockwood,[2] near Huddersfield, by assuming a flexibility in the lobes of an ice-sheet which it is hard to match at the present time. Again, the boulder clay of the eastern counties is crowded, as we have described, with pebbles of chalk, which are not generally of local origin, but have come from north of the Wash. Whether from the bed of a river or from a sea-beach, they are certainly water-worn. But if preglacial, the supply would be quickly exhausted, so that they would usually be confined to the lower part of the clay. As it is, though perhaps they run larger here, they abound throughout. The so-called moraines near York (supposed to have been left by a glacier retreating up that vale), those in the neighbourhood of Flamborough Head and of Sheringham (regarded as relics of the North Sea ice-sheet) do not, in my opinion, show any important difference in outline from ordinary hills of sands and gravels, and their materials are wholly unlike those of any indubitable moraines that I have either seen or studied in photographs. It may be said that the British glaciers passed over very different rocks from the Alpine; but the Swiss molasse ought to have supplied abundant sand, and the older interglacial gravels quantities of pebbles; yet the differences between the morainic materials on the flank of the Jura or near the town of Geneva and those close to the foot of the Alps are varietal rather than specific.

Some authorities, however, attribute such magnitude to the ice-sheets radiating from Scandinavia that they depict them, at the time of maximum extension, as not only traversing the North Sea bed and trespassing upon the coast of England, but also radiating southward to overwhelm Denmark and Holland, to invade Northern Germany and Poland, to obliterate Hanover, Berlin, and Warsaw, and to stop but little short of Dresden and Cracow, while burying Russia on the east to within no great distance of the Volga, and on the south to the neighbourhood of Kief. Their presence, however, so far as I can ascertain, is inferred from evidence[3] very similar to that which we have discussed in

[1] That this has occurred at Cromer is a very dubious hypothesis (see *Geol. Mag.*, 1905, pp. 397, 524). The curious relations of the drift and chalk in the islands of Moen and Rügen are sometimes supposed to prove the same action. Knowing both well, I have no hesitation in saying that the chalk there is, as a rule, as much *in situ* as it is in the Isle of Wight.

[2] About half-way across England and 810 feet above sea-level. P. F. Kendall, *Quart. Journ. Geol. Soc.*, lviii. (1902), p. 498.

[3] A valuable summary of it is given in *The Great Ice Age*, J. Geikie, ch. xxix., xxx. (1894).

the British lowlands. That Scandinavia was at one time almost wholly buried beneath snow and ice is indubitable; it is equally so that at the outset the land stood above its present level, and that during the later stages of the Glacial Epoch parts, at any rate of Southern Norway, had sunk down to a maximum depth of 800 feet. In Germany, however, erratics are scattered over its plain and stranded on the slopes of the Harz and Riesengebirge up to about 1400 feet above sea-level. The glacial drifts of the lowlands sometimes contain dislodged masses of neighbouring rocks like those at Cromer, and we read of other indications of ice action. I must, however, observe that since the glacial deposits of Möen, Warnemünde, and Rügen often present not only close resemblances to those of our eastern counties, but also very similar difficulties, it is not permissible to quote the one in support of the other, seeing that the origin of each is equally dubious. Given a sufficient "head" of ice in northern regions, it might be possible to transfer the remains of organisms from the bed of the Irish Sea to Moel Tryfaen, Macclesfield, and Gloppa; but at the last-named, if not at the others, we must assume the existence of steadily alternating currents in the lakes in order to explain the corresponding bedding of the deposit. This, however, is not the only difficulty. The "Irish Sea glacier" is supposed to have been composed of streams from Ireland, South-West Scotland, and the Lake District, of which the second furnished the dominant contingent: the first-named not producing any direct effect on the western coast of Great Britain, and the third being made to feel its inferiority and "shouldered in upon the mainland." But even if this ever happened, ought not the Welsh ice to have joined issue with the invaders a good many miles to the north of its own coast?[1] Welsh boulders at any rate are common near the summit of Moel Tryfaen, and I have no hesitation in saying that the pebbles of riebeckite-rock, far from rare in its drifts, come from Mynydd Mawr, hardly half a league to the E.S.E., and not from Ailsa Craig.[2]

As such frequent appeal is made to the superior volume of the ice-sheet which poured from the Northern Hills over the bed of the Irish Sea, I will compare in more detail the ice-producing capacities of the several districts. The present temperature of West-Central Scotland may be taken as 47°; its surface as averaging about 2500 feet, rising occasionally to nearly 4000 feet above sea-level. In the western part of the Southern Uplands the temperature is a degree higher, and the average for altitude at most not above 1500 feet. In the Lake District

[1] From Moel Tryfaen to the nearest point of Scotland is well over a hundred miles, and it is a few less than this distance from Gloppa to the Lake District. In order to allow the Irish Sea ice-sheet to reach the top of Moel Tryfaen the glacier productive power of Snowdonia has been minimised (Wright, *Man and the Glacial Epoch*, pp. 171, 172). But the difference between that and the Arenig region is not great enough to make the one incompetent to protect its own borderland, while the other could send an ice-sheet which could almost cover the Clent Hills and reach the neighbourhood of Birmingham. Anglesey also, if we suppose a slight elevation and a temperature of 29° at the sea-level, would become a centre of ice-distribution and an advance guard to North Wales.

[2] The boulders of picrite near Porth Nobla, from Llanerchymedd, though they have travelled southward, have moved away much to the west.

and the Northern Pennines the temperature is increased by another degree, and the heights are, for the one 1800 feet with a maximum of 3162 feet, for the other 1200 feet and 2892 feet. In North Wales the temperature is 50°, the average height perhaps 2000 feet, and the culminating point 3571 feet. For the purpose of comparing the ice-producing powers of these districts we may bring them to one temperature by adding 300 feet to the height for each degree below that of the Welsh region. This would raise the average elevation of Central and Southern Scotland to 3400 feet and 2100 feet respectively; for the Lake District and Northern Pennines to 2100 feet and 1500 feet. We may picture to ourselves what this would mean, if the snow-line were at the sea-level in North Wales, by imagining 8000 feet added to its height and comparing it with the Alps. North Wales would then resemble a part of that chain which had an average height of about 10,000 feet above sea-level, and culminated in a peak of 11,571 feet; the Lake District would hardly differ from it; the Northern Pennines would be like a range of about 9000 feet, its highest peak being 11,192 feet. Southern Scotland would be much the same in average height as the first and second, and would rise, though rarely, to above 11,000 feet; the average in Central Scotland would be about 11,400 feet, and the maximum about 13,000 feet. Thus North Wales, the Lake District, and the Southern Uplands would differ little in ice-productive power; while Central Scotland would distinctly exceed them, but not more than the group around the Finsteraarhorn does that giving birth to the Rhone glacier. In one respect, however, all these districts would differ from the Alps—that, at 8000 feet, the surface, instead of being furrowed with valleys, small and great, would be a gently shelving plateau, which would favour the formation of piedmont glaciers. Still, unless we assume the present distribution of rainfall to be completely altered (for which I do not know any reason), the relative magnitudes of the ice coming from these centres (whether separate glaciers or confluent sheets) could differ but little. Scotch ice would not appreciably "shoulder inland" that from the Lake District, nor would the Welsh ice be imprisoned within its own valleys.

During the last few years, however, the lake-hypothesis of Carvill Lewis has been revived under a rather different form by some English advocates of land-ice. For instance, the former presence of ice-dammed lakes is supposed to be indicated in the upper parts of the Cleveland Hills by certain overflow channels. I may be allowed to observe that, though this view is the outcome of much acute observation and reasoning,[1] it is wholly dependent upon the ice-barriers already mentioned, and that if they dissolve before the dry light of sceptical criticism, the lakes will "leave not a rack behind." I must also confess that to my eyes the so-called "overflow channels" much more closely resemble the remnants of ancient valley-systems, formed by only moderately rapid rivers, which have been isolated by the trespass of younger and more energetic streams, and they suggest that the main features of this picturesque upland were

[1] P. F. Kendall, Quart. Journ. Geol. Soc. Lond., 1902, p. 471.

developed before rather than after the beginning of the Glacial Epoch. I think that even "Lake Pickering," though it has become an accepted fact with several geologists of high repute, can be more simply explained as a two-branched "valley of strike," formed on the Kimeridge clay, the eastern arm of which was beheaded, even in preglacial times, by the sea.[1] As to Lake Oxford,[2] I must confess myself still more sceptical. Some changes no doubt have occurred in later glacial and postglacial times: valleys have been here raised by deposit, there deepened sometimes by as much as 100 feet; the courses of lowland rivers may occasionally have been altered: but I doubt whether, since those times began, either ice-sheet or lake has ever concealed the site of that University city.

The submergence hypothesis assumes that, at the beginning of the Glacial Epoch, our islands stood rather above their present level, and during it gradually subsided, on the west to a greater extent than on the east, till at last the movement was reversed, and they returned nearly to their former position. During most of this time glaciers came down to the sea from the more mountainous islands, and in winter an ice-foot formed upon the shore. This, on becoming detached, carried away boulders, beach pebbles, and finer detritus. Great quantities of the last also were swept by swollen streams into the estuaries and spread over the sea bed by coast-currents, settling down especially in the quiet depths of submerged valleys. Shore-ice in Arctic regions, as Colonel H. W. Feilden[3] has described, can striate stones and even the rock beneath it, and is able, on a subsiding area, gradually to push boulders up to a higher level. In fact the state of the British region in those ages would not have been unlike that still existing near the coasts of the Barents and Kara Seas. Over the submerged region southward, and in some cases more or less eastward, currents would be prevalent: though changes of wind[4] would often affect the drift of the floating ice-rafts. But though the submergence hypothesis is obviously free from the serious difficulties which have been indicated in discussing the other one, gives a simple explanation of the presence of marine organisms, and accords with what can be proved to have occurred in Norway, Waigatz Island, Novaia Zemlya, on the Lower St. Lawrence, in Grinnell Land, and elsewhere,[5] it undoubtedly involves others. One of them—the absence of shore terraces, caves, or other sea marks—is perhaps hardly so grave as it is often thought to be. It may be met by the remark that unless the Glacial Age lasted for a very long time and the movements were interrupted by well-marked pauses, we could not expect to find any such record. In regard also to another objection, the rather rare and sporadic occurrence of marine shells, the answer would be that, on the Norway

[1] See for instance the courses of the Medway and the Beult over the Weald Clay (C. Le Neve Foster and W. Topley, *Quart. Journ. Geol. Soc.*, xxi. (1865), p. 443).

[2] F. W. Harmer, *Quart. Journ. Geol. Soc.*, lxiii. (1907), p. 170.

[3] *Quart. Journ. Geol. Soc.*, xxxiv. (1878), p. 556.

[4] See p. 23, and for the currents now dominant consult Dr. H. Bassett in Professor Herdman's Report on the Lancashire Sea Fisheries, *Trans. Biol. Soc. Liverpool*, xxiv. (1910), p. 123.

[5] See *Ice Work*, p. 221, and *Geol. Mag.*, 1900, p. 289.

coast, where the ice-worn rock has certainly been submerged, sea-shells are far from common and occur sporadically in the raised deltaic deposits of the fjords.[1] An advocate of this view might also complain, not without justice, that, if he cited an inland terrace, it was promptly dismissed as the product of an ice-dammed lake, and his frequent instances of marine shells in stratified drifts were declared to have been transported from the sea by the lobe of an ice-sheet; even if they have been carried across the path of the Arenig ice, more than forty miles, as the crow flies, from the Irish Sea up the Valley of the Severn, or forced some 1300 feet up Moel Tryfaen.[2] The difficulty in the latter case, he would observe, is not met by saying the ice-sheet would be able to climb that hill "given there were a sufficient head behind it."[3] That ice can be driven uphill has long been known, but the existence of the "sufficient head" must be demonstrated, not assumed. There may be "no logical halting-place between an uplift of ten or twenty feet to surmount a *roche moutonnée* and an equally gradual elevation to the height of Moel Tryfaen," yet there is a common-sense limitation, even to a destructive *sorites*. The argument, in fact, is more specious than valid, till we are told approximately how thick the northern ice must be to produce the requisite pressure, and whether such an accumulation would be possible. The advocates of land ice admit that, before it had covered more than a few leagues on its southward journey its thickness was less than 2000 feet, and we are not entitled, as I have endeavoured to show, to pile up ice indefinitely on either our British highlands or the adjacent sea-bed. The same reason also forbids us largely to augment the thickness of the latter by the snowfall on its surface, as happens to the Antarctic barrier ice. Even if the thickness of the ice-cap over the Dumfries and Kirkcudbright hills had been about 2500 feet, that, with every allowance for viscosity, would hardly give us a head sufficient to force a layer of ice from the level of the sea-bed to a height of nearly 1400 feet above it and at a distance of more than 100 miles.

Neither can we obtain much support from the instance in Spitzbergen, described by Professors Garwood and Gregory, where the Ivory Glacier, after crossing the bed of a valley, had transported marine shells and drift from the floor (little above sea-level) to a height of about 400 feet on the opposite slope. Here the valley was narrow, and the glacier had descended from an inland ice-reservoir, much of which was

[1] If, as seems probable, the temperature was changing rather rapidly the old fauna would be pauperised and the new one make its way but slowly into the British fjords.

[2] Critics of the submergence hypothesis seem to find a difficulty in admitting downward and upward movements, amounting sometimes to nearly 1400 feet during Pleistocene Ages; but in the northern part of America the upheaval, at any rate, has amounted to about 1000 feet, while on the western coast, beneath the lofty summit of Mount St. Elias, marine shells of existing species have been obtained some 5000 feet above sea-level. It is also admitted that in several places the pre-glacial surface of the land was much above its present level. On the Red River, whatever be the explanation, foraminifers, radiolarians, and sponge spicules have been found at 700 feet above sea-level, and near Victoria, on the Saskatchewan, even up to about 1900 feet.

[3] P. F. Kendall in Wright's *Man and the Glacial Period*, p. 171.

at least 2800 feet above the sea, and rose occasionally more than a thousand feet higher.[1]

But other difficulties are far more grave. The thickness of the chalky boulder clay alone, as has been stated, not unfrequently exceeds 100 feet, and, though often much less, may have been reduced by denudation. This is an enormous amount to have been transported and distributed by floating ice. The materials also are not much more easily accounted for by this than by the other hypothesis. A continuous supply of well-worn chalk pebbles might indeed be kept up from a gradually rising or sinking beach, but it is difficult to see how, until the land had subsided for at least 200 feet, the chalky boulder clay could be deposited in some of the East Anglian valleys or on the Leicestershire hills. That depression, however, would seriously diminish the area of exposed chalk in Lincolnshire and Yorkshire, and the double of it would almost drown that rock. Again, the East Anglian boulder clay, as we have said, frequently abounds in fragments and finer detritus from the Kimeridge and Oxford clays. But a large part of their outcrop would disappear before the former submergence was completed. Yet the materials of the boulder clay, though changing as it is traced across the country, more especially from east to west, seem to vary little in a vertical direction. The instances, also, of the transportation of boulders and smaller stones to higher levels, sometimes large in amount, as in the transference of "brockram" from outcrops near the bed of the Eden valley to the level of Stainmoor Gap, seem to be too numerous to be readily explained by the uplifting action of shore-ice in a subsiding area. Such a process is possible, but we should anticipate it would be rather exceptional.

Submergence also readily accounts for the above-named sands and gravels, but not quite so easily for their occurrence at such very different levels. On the eastern side of England gravelly sands may be found beneath the chalky boulder clay from well below sea-level to three or four hundred feet above it. Again, since, on the submergence hypothesis, the lower boulder clay about the estuaries of the Dee and the Mersey must represent a deposit from piedmont ice in a shallow sea, the mid-glacial sand (sometimes not very clearly marked in this part) ought not to be more than forty or fifty feet above the present Ordnance datum. But at Manchester it reaches over 200 feet, while near Heywood it is at least 425 feet. In other words the sands and gravels, presumably (often certainly) mid-glacial, mantle, like the upper boulder clay, over great irregularities of the surface, and are sometimes found, as already stated, up to more than 1200 feet. Either of these deposits may have followed the sea-line upwards or downwards, but that explanation would almost compel us to suppose that the sand was deposited during the submergence and the upper clay during the emergence; so that, with the former material, the higher in position is the newer in time, and with the latter the reverse. We must not, however, forget

[1] *Quart. Journ. Geol. Soc.*, liv. (1898), p. 205. Earlier observations of some upthrust of materials by a glacier are noted on p. 219.

that in the island of Rügen we find more than one example of a stratified gravelly sand between two beds of boulder clay (containing Scandinavian erratics) which present some resemblance to the boulder clays of Eastern England, while certain glacial deposits at Warnemünde, on the Baltic coast, sometimes remind us of the Contorted Drift of Norfolk.

Towards the close of the Glacial Epoch, the deposition of the boulder clay ceased[1] and its denudation began. On the low plateaux of the Eastern Counties it is often succeeded by coarse gravels, largely composed of flint, more or less water-worn. These occasionally include small intercalations of boulder clay, have evidently been derived from it, and indicate movement by fairly strong currents. Similar gravels are found overlying the boulder clay in other parts of England, sometimes at greater heights above sea-level. Occasionally the two are intimately related. For instance, a pit on the broad, almost level, top of the Gogmagog Hills, about 200 feet above sea-level and four miles south of Cambridge, shows a current-bedded sand and gravel, overlain by a boulder clay, obviously rearranged; while other pits in the immediate neighbourhood expose varieties and mixtures of one or the other material. But, as true boulder clay occurs in the valley below, these gravels must have been deposited, and that by rather strong currents, on a hill-top—a thing which seems impossible under anything like the existing conditions; and, even if the lowland were buried beneath ice full 200 feet in thickness, which made the hill-top into the bed of a lake, it is difficult to understand how the waters of that could be in rapid motion. Rearranged boulder clays also occur on the slopes of valleys[2] which may be explained, with perhaps some of the curious sections near Sudbury, by the slipping of materials from a higher position. But at Old Oswestry gravels with indications of ice-action are found at the foot of the hills almost 700 feet below those of Gloppa.

Often the plateau gravels are followed at a lower level by terrace gravels,[3] which descend towards the existing rivers, and suggest that valleys have been sometimes deepened, sometimes only re-excavated. The latter gravels are obviously deposited by rivers larger and stronger than those which now wind their way seawards, but it is difficult to explain the former gravels by any fluviatile action, whether the water from a melting ice-sheet ran over the land or into a lake, held up by some temporary barrier. But the sorting action of currents in a slowly shallowing sea would be quite competent to account for them, so they afford an indirect support to the hypothesis of submergence. It is, however, generally admitted that there have been oscillations both of level and of climate since any boulder clay was deposited in the districts south of the Humber and the Ribble. The passing of the Great Ice Age was not sudden, and glaciers may have lingered in our mountain regions when palæolithic man hunted the mammoth in the valley of the Thames,

[1] Probably deposits of a distinctly glacial [illegible] continued in the northern districts, but on these we need not linger.

[2] For instance [illegible] in the valley of the Lark.

[3] These contain the instruments worked by palæolithic (Acheulean) man who, in this country at any rate, is later than the chalky boulder clay.

or frequented the caves of Devon and Mendip. But of these times of transition before written history became possible, and of sundry interesting topics connected with the Ice Age itself—of its cause, date, and duration, whether it was persistent or interrupted by warmer episodes, and, if so, by what number, of how often it has already recurred in the history of the earth—I must, for obvious reasons, refrain from speaking, and content myself with having endeavoured to place before you the facts of which, in my opinion, we must take account in reconstructing the physical geography of Western Europe, and especially of our own country, during the Age of Ice.

Not unnaturally you will expect a decision in favour of one or the other litigant after this long summing up. But I can only say that, in regard to the British Isles, the difficulties in either hypothesis appear so great that, while I consider those in the "land-ice" hypothesis to be the more serious, I cannot as yet declare the other one to be satisfactorily established, and think we shall be wiser in working on in the hope of clearing up some of the perplexities. I may add that, for these purposes, regions like the northern coasts of Russia and Siberia appear to me more promising than those in closer proximity to the North or South Magnetic Poles. This may seem a "lame and impotent conclusion" to so long a disquisition, but there are stages in the development of a scientific idea when the best service we can do it is by attempting to separate facts from fancies, by demanding that difficulties should be frankly faced instead of being severely ignored, by insisting that the giving of a name cannot convert the imaginary into the real, and by remembering that if hypotheses yet on their trial are treated as axioms, the result will often bring disaster, like building a tower on a foundation of sand. To scrutinise, rather than to advocate any hypothesis, has been my aim throughout this address, and, if my efforts have been to some extent successful, I trust to be forgiven, though I may have trespassed on your patience and disappointed a legitimate expectation.

GEOGRAPHY AND SOME OF ITS PRESENT NEEDS.[1]

By A. J. Herbertson, M.A., Ph.D., Professor of Geography in the University of Oxford.

At the close of a reign which has practically coincided with the first decade of a new century, it is natural to look back and summarise the progress of geography during the decade. At the beginning of a new reign it is equally natural to consider the future. Our new sovereign is one of the most travelled of men. No monarch knows the World as he knows it; no monarch has ruled over a larger Empire or seen more of his dominions. His advice has been to wake up, to consider and to act.

[1] Presidential Address delivered to Section E (Geography) at the Sheffield Meeting of the British Association for the Advancement of Science, 1910.

It will be in consonance with this advice if I pay more attention to the geography of the present and future than to that of the past, and say more about its applications than about its origins.

Yet I do so with some reluctance, for the last decade has been one of the most active and interesting in the history of our science. The measurement of new and the remeasurement of old arcs will give us better data for determining the size and shape of the Earth. Surveys of all kinds, from the simple route sketches of the traveller to the elaborate cadastral surveys of some of the more populous and settled regions, have so extended our knowledge of the surface features of the Earth that a map on the scale of 1 : 1,000,000 is not merely planned, but actually partly executed. Such surveys and such maps are the indispensable basis of our science, and I might say much about the need for accurate topographical surveys. This however has been done very fully by some of my predecessors in this chair in recent years.

The progress of oceanography has also been great. The soundings of our own and other Admiralties, of scientific oceanographical expeditions, and those made for the purpose of laying cables, have given us much more detailed knowledge of the irregularities of the ocean floor. An international map of oceanic contours due to the inspiration and munificence of the Prince of Oceanographers and of Monaco has been issued during the decade, and so much new material has accumulated that it is now being revised. A comparison of the old and new editions of Krümmel's *Oceanographie* shows us the immense advances in this subject.

Great progress has been made on the geographical side of meteorology and climate. The importance of this knowledge for tropical agriculture and hygiene has led to an increase of meteorological stations all over the hot belt—the results of which will be of immense value to the geographer. Dr. Bartholomew's *Atlas of Meteorology* appeared at the beginning, and Sir John Eliot's *Meteorological Atlas of India* at the end of the decade. Dr. Hann's *Lehrbuch* and the new edition of his *Climatology*, Messrs. Hildebrandsson and Teisserenc de Bort's great work, and the recent studies of the Upper Atmosphere, are among the landmarks of progress. The record is marred only by the closing of Ben Nevis Observatory. A comparison of the present number and distribution of meteorological stations with those given in Bartholomew's Atlas of 1899 would show how great the extension of this work has been.

I have not time to recapitulate the innumerable studies of geographical value issued by many meteorological services, observatories and observers —public and private—but I may call attention to the improved weather maps and to the excellent pilot charts of the North Atlantic and of the Indian Ocean published monthly by our Meteorological Office.

Lake studies have also been a feature of this decade, and none are so complete or so valuable as the Scottish Lakes Survey—a work of national importance, undertaken by private enthusiasm and generosity. We have to congratulate Sir John Murray and Mr. Pullar on the completion of a great work.

In Geology I might note that we now possess a map of Europe on a

scale of 1 : 1,500,000 prepared by international co-operation, and also one of North America on a smaller scale. The thanks and congratulations of all geographers are due to Professor Suess on the conclusion of his classical study of the Face of the Earth, the first comprehensive study of the main divisions and characteristics of its skeleton. English readers are indebted to Professor and Miss Sollas for the brilliant English translation which they have prepared.

A new movement, inspired mainly by Professor Flahault in France, Professor Geddes in this country, Professors Engler, Drude, and Schimper in Germany, has arisen among botanists, and at last we have some modern botanical geography which is really valuable to the geographer. I wish we could report similar progress in zoological geography, but that, I trust, will come in the next decade.

I pass over the various expensive arbitrations and commissions to settle boundary disputes which have in many cases been due to geographical ignorance, also the important and fascinating problems of the growth of our knowledge of the distribution of economic products and powers existing and potential, and the new geographical problems for statesmen due to the political and economic revolutions in Japan and China.

It is quite impossible to deal with the exploration of the decade. Even in the past two years we have had Peary and Shackleton, Stein and Hedin, the Duke of the Abruzzi, and a host of others returning to tell us of unknown or little known parts of the globe. We hope to hear soon from Dr. Charcot the results of his Antarctic investigations.

Further work is being undertaken by Scott and his companions, by Bruce, Amundsen, Filchner, and others, in the South or North Polar ice worlds : by Longstaff, Bruce, and others in the mountains of India and Central Asia : by Goodfellow and Ryder in New Guinea : and by many other geographical expeditions.

One word of caution may, perhaps, be permitted. There is a tendency on the part of the public to confuse geographical exploration and sport. The newspaper reporter naturally lays stress on the unusual in any expedition, the accidental rather than the essential, and those of us who have to examine the work of expeditions know how some have been unduly boomed because of some adventurous element, while others have not received adequate popular recognition because all went well. The fact that all went well is in itself a proof of competent organisation. There is no excuse for us in this section if we fall into the journalist's mistake, and we shall certainly be acting against the interests of both our science and our section if we do so.

It was not my intention in this address to raise the question of what is Geography, but various circumstances make it desirable to say a few words upon it. We are all the victims of the geographical teaching of our youth, and it is easy to understand how those who have retained unchanged the conceptions of geography they gained at school many years ago cavil at the recognition of geography as a branch of science. Moreover, the geography of the schools still colours the conceptions of some geographers who have nevertheless done much to make school geography scientific and educational. Many definitions of geography are

consequently too much limited by the arbitrary but traditional division of school subjects. In schools tradition and practical convenience have on the whole rightly determined the scope of the different subjects. Geography in schools is best defined as the study of the Earth as the home of Man; its limits should not be too closely scrutinised in schools, where it should be used freely as a co-ordinating subject.

The present division into sections of the British Association is also largely a matter of practical convenience, but we are told that the present illogical arrangement of sections distresses some minds. No doubt there are some curious anomalies. The most glaring, perhaps, is that of combining mathematics with physics—as if mathematical methods were used in no other subjects.

There is a universal tendency to sub-division and an ever-increasing specialism, but there is also an ever-growing interdependence of different parts of science which the British Association is unquestionably bound to take into account. At present this is chiefly done by joint meetings of sections, a wise course, of which this section has been one of the chief promoters. It is possible that some more systematic grouping of sections might be well advised, but such a reform should be systematic and not piecemeal. It is one which raises the whole question of the classification of knowledge. This is so vast a problem, and one on which such divergent opinions are held that I must apologise for venturing to put forward some tentative suggestions.

It might be found desirable to take as primary divisions the Mathematical, Physical, Biological, Anthropological, and Geographical groups. Statistics might be regarded as a subdivision of Mathematics or as a field common to Mathematics and other groups. In the Physical Group might be the sub-divisions Physics and Chemistry. Each would devote a certain proportion of time to its applied aspects—or these might be dealt with in sub-sections, which would include Engineering and Applied Chemistry. In the Biological Group there would be Botany, Zoology, in both cases including Palæontology and Embryology, and Applied Biology, which would be dealt with in one or other of the ways I have suggested, and would include Agriculture, Fisheries, etc. (Medicine we leave out at present.) Mathematical applications would be considered in each of the other sections which use mathematical notations. In the Anthropological group there would be the present Anthropology and Theoretical Economics with Applied Economics and Administration, together with a section on Psychology, which might be attached to Physiology and have the Education section as the practical appendage. In the Geographical group there would be Geography and Geology, the practical applications of Geography being considered in joint meetings, or in sub-sections—for instance, Geography and Physics for questions of Atmospheric and Oceanic Circulation, Geography and Economics for questions of Transportation, etc.

So much, then, for the classification of Geography with reference to the other sciences. I should like to say a few words about geographical classification and geographical terminology.

In the scheme of the Universe it is possible to consider the Earth as

a unit, with its own constitution and history. It has an individuality of its own, though for the astronomer it is only one example of a particular type of heavenly bodies. As geographers we take it as our unit individual in the same way that an anatomist takes a man. We see that it is made up of different parts, and we try to discover what these are, of what they are composed, what their function is, what has been their history.

One fundamental division is into land, water, and air. Each has its forms and its movements. The forms are more obvious and persistent in the land. They are least so in the atmosphere, though forms exist—some of which are at times made visible by clouds, and many can be clearly discerned on isobaric charts. The land is the temporarily permanent; the water and atmosphere the persistently mobile, the latter more so than the former. The stable forms of the land help to control the distribution and movements of the waters, and to a less extent those of the atmosphere. How great the influence of the distribution of land and water is on the atmosphere may be seen in the monsoon region of Eastern Asia.

We can analyse and classify the sub-divisions of the land, the water, and the atmosphere. Each has given rise to a special branch of study.

Geomorphology deals with the forms of the land and their shaping—Geomorphology, Oceanography, and Climatology. Three things have to be kept clearly in view: (i) The structure, including the composition, of the more permanent substance of the form; (ii) The forces which are modifying it; and (iii) The phase in the cycle of forms characteristic of such structure acted on by such forms. We may say that any form is a function of structure, process, and time. The matter is even more complicated, for we have instances, *e.g.* in antecedent drainage systems, of the conditions of a previous cycle affecting a subsequent one—a kind of heredity of forms which cannot be neglected.

The geomorphologist is seeking for a genetic classification of forms, and in the works of Bertrand, Davis, Penck, Richthofen, and Supan and others are being accumulated the materials for a more complete and systematic classification of forms. As you all know, the question of terms for the manifold land-forms is a difficult one and apt to engender much more controversy than the analysis of the forms themselves. I have long thought that we shall be driven to some notation analogous to that of the chemists. I have not yet had time to work such a notation out in detail, but it might take the form of using different symbols for the three factors noted above—say, letters for different kinds of structure, and, say, Arabic figures for processes, and Roman figures for the stage of a cycle the form has reached.

Take a very simple set of structures and indicate each by a letter:—

			Undisturbed.	Faulted.
Structure.	homogeneous,		A	A′
	layered,	horizontal,	B	B′
		tilted,	C	C′
		folded,	D	D′
	mixed,		E	E′

If pervious or impervious, a p or an i could be added—*e.g.* a tilted limestone with faults would be C′p.

Next indicate the commoner erosion processes by Arabic numerals:—

Process,	moving water,	1
	ice,	2
	wind,	3
	sea,	4

One process may have followed another, *e.g.* where a long period of ice erosion has been followed by water erosion we might write 2·1, where these alternate annually, say 21.

The phase of the cycle might be denoted by Roman figures. A scale of V might be adopted and I, III, and V, used for youthful, middle-aged and old-aged, as Professor Davis calls them; or early, middle, and late phases, as I prefer to term them. II and IV would denote intermediate stages.

A scarped limestone ridge in a relatively mature phase like the Cotswolds would be, if we put the process first—1 C′ III.; a highland like the Southern Uplands of Scotland would be denoted by the formula 1. 2·1 E′ III.

This is the roughest suggestion, but it shows how we could label our cases of notes, and pigeon-hole our types of forms—and prevent for the present undue quarrelling over terms. No doubt there would be many discussions about the exact phase of the cycle, for example, whether ice in addition to water has been an agent in shaping this or that form. But, after all, these discussions would be more profitable than quarrels as to which descriptive term, or place name, or local usage should be adopted to distinguish it.

In the case of climatology, there is coming to be a general consensus of opinion as to what are the chief natural divisions, and the use of figures and letters to indicate them has been followed by several authors. This should also be attempted for oceanography.

If any international agreement of symbols and colours could be come to for such things it would be a great gain, and I hope to bring this matter before the next International Geographical Congress.

We have still to come to Geography proper. What are the units smaller than the whole earth with which our science has to deal? When we fix our attention on parts of the earth, and ask what is a natural unit, we are hampered by preconceptions. We recognise species, or genera, families, or races as units—but they are abstract rather than concrete units. Speaking for myself, I should say that every visible concrete natural unit on the earth's surface consisting of more than one organic individual is a geographical unit. It is a common difficulty not to be able to see the wood for the trees; it is still more difficult to recognise that the wood consists of more than trees, that it is a complex of trees and other vegetation, fixed to a definite part of the solid earth and bathed in air.

The family, the species, and the race are abstract ideas. If we consider them as units, it is because they have a certain historical continuity.

They have not an actual physical continuity as the component parts of an individual have. Concrete physical continuity is what differentiates the geographical unit. We may speak of a town or state as composed of people, but a complete conception of either must include the special connections which unite its parts. A town is not merely an association of individuals, nor is it simply a piece of land covered with streets and buildings; it is a combination of both.

In determining the greater geographical units, man need not be taken into account. We are too much influenced by the mobility of man, by his power to pass from one region to another, and we are apt to forget that his influence on his environment is negligible except when we are dealing with relatively small units. The geographer will not neglect man: he will merely be careful to prevent himself from being unduly influenced by the human factor in selecting his major units.

Some geographers and many geologists have suggested that land forms alone need be taken into account in determining these geographical units. Every different recognisable land form is undoubtedly a geographical unit. A great mountain system, such as that of Western North America, or a vast lowland such as that which lies to the east of the Rocky Mountains, is undoubtedly a geographical unit of great importance, but its sub-divisions are not necessarily orographical. The shores of the Gulf of Mexico could not be considered as geographically similar to those of the Arctic Ocean, even if they were morphologically homologous. The lowlands of the Arctic area are very different from those at or near the tropics. The rhythm of their life is different, and this difference is revealed in the differences of vegetation. I wish to lay great stress on the significance of vegetation to the geographer for the purposes of regional classification. I do not wish to employ a biological terminology nor to raise false analogies between the individual organism and the larger units of which it is a part, but I think we should do well to consider what may be called the life or movement going on in our units as well as their form. We must consider the seasonal changes of its atmospheric and of its water movements, as well as the parts of the earth's crust which they move over and even slightly modify. For this purpose a study of climatic regions is as necessary as a study of morphological regions.

By vegetation I mean not the flora, the historically related elements, but the vegetable coating, the space-related elements. Vegetation in this sense is a geographical phenomenon of fundamental importance. It indicates quality—quality of atmosphere and quality of soil. It is a visible synthesis of the climatic and edaphic elements. Hence the vast lowlands of relatively uniform land features are properly divided into regions according to vegetation—tundra, pine forest, deciduous forest, warm evergreen forest, steppe, and scrub. Such differences of vegetation are full of significance even in mountainous areas.

The search after geographical unity—after general features common to recognisable divisions of the earth's surface, the analysis of these, their classification into types, the comparisons between different examples of the types—seem to me among the first duties of a geographer. Two sets

of maps are essential—topographical and vegetational—the first dealing with the superficial topography and as far as possible its surface irregularities, the latter indicating quality of climate and soil.

Much has been said in recent years—more particularly from this Presidential chair—on the need for reliable topographical maps. Without such maps no others can be made. But when they are being made it would be very easy to have a general vegetational map compiled. Such maps are even more fundamental than geological maps, and they can be constructed more rapidly and cheaply. Every settled country, and more particularly every partially settled country, will find them invaluable if there is to be any intelligent and systematic utilisation of the products of the country.

I am assuming that the geographer's task is to study environments, to examine the forms and qualities of the earth's surface, and to recognise, define, and classify the different kinds of natural units into which it can be divided. For these we have not as yet even names. It may seem absurd that there should be this want of terms in a subject which is associated in the minds of most people with a superfluity of names. I have elsewhere suggested the use of the terms major natural region, natural region, district, and locality to represent different grades of geographical units, and have also attempted to map the seventy or eighty major natural regions into which the earth's surface is divided, and to classify them into about twenty types. These tentative divisions will necessarily become more accurate as research proceeds, and the minor natural regions into which each major natural region should be divided will be definitely recognised, described, and classified. Before this can be done, however, the study of geomorphology and of plant formations must be carried far beyond the present limits.

At the opposite end of the scale, that is in the geographical study of localities, good work is beginning to be done. Dr. H. R. Mill, one of the pioneers of geography in this country and one of my most distinguished predecessors in this chair, has given us in his study of south-west Sussex an admirable example of the geographical monograph proper, which takes into account the whole of the geographical factors involved. He has employed quantitative methods as far as these could be applied, and in doing so has made a great step in advance. Quantitative determinations are at least as essential in geographical research as the consideration of the time factor.

The geomorphologist and the sociologist have also busied themselves with particular aspects of selected localities. Professor W. M. Davis, of Harvard, has published geomorphological monographs which are invaluable as models of what such work should be. In a number of cases he has passed beyond mere morphology and has called attention to the organic responses associated with each land form. Some of the monographs published under the supervision of the late Professor Ratzel, of Leipzig, bring out very clearly the relation between organic and inorganic distributions, and some of the monographs of the Le Play school incidentally do the same.

At present there is a double need. Research may take the form,

in the first place, of collecting new information, or, in the second place, of working up the material which is continually being accumulated.

The first task—that of collecting new information—is no small one. In many cases it must be undertaken on a scale that can be financed only by Governments. The Ordnance and Geological Surveys of our own and other countries are examples of Government departments carrying on this work. We need more of them. We need urgently a Hydrographical Department, which would co-operate with Dr. Mill's rainfall organisation. It would be one of the tasks of this department to extend and co-ordinate the observations on river and lake discharge, which are so important from an economic or health point of view that various public bodies have had to make such investigations for the drainage areas which they control. Such research work as that done by Dr. Strahan for the Exe and Medway would be of the greatest value to such a department, which ought to prepare a map showing all existing water rights, public and private.

We shall see how serious the absence of such a department is if we consider how our water supply is limited, and how much of it is not used to the best advantage. We must know its average quantity and the extreme variations of supply. We must also know what water is already assigned to the uses of persons and corporations, and what water is still available. We shall have to differentiate between water for the personal use of man and animals, and water for industrial purposes. The actualities and the potentialities can be ascertained and should be recorded and mapped.

In the second direction of research—that of treating from the geographical standpoint the data accumulated, whether by Government departments or by private initiative—work has as yet hardly been begun.

The topographical work of the Ordnance Survey is the basis of all geographical work in our country. The Survey has issued many excellent maps, none more so than the recently published half-inch contoured and hill-shaded maps with colours in layers. Its maps are not all above criticism; for instance, few can be obtained for the whole kingdom having precisely the same symbols. It has not undertaken some of the work that should have been done by a national cartographic service—for instance, the lake survey. Nor has it yet done what the Geological Survey has done—published descriptive accounts of the facts represented on each sheet of the map. From every point of view these are great defects: but in making these criticisms we must not forget (i) that the Treasury is not always willing to find the necessary money, and (ii) that the Ordnance Survey was primarily made for military purposes, and that the latest map it has issued has been prepared for military reasons. It has been carried out by men who were soldiers first and topographers after, and did not necessarily possess geographical interests. The ideal geographical map, with its accompanying geographical memoir, can be produced only by those who have had a geographical training. Dr. Mill, in the monograph already referred to, has shown us how to prepare systematised descriptions of the one-inch map sheets issued by the Ordnance Survey.

At Oxford we are continuing Dr. Mill's work. We require our diploma students to select some district shown on a sheet of this map for detailed study by means of map measurements, an examination of statistics and literature which throw light on the geographical conditions, and, above all, by field work in the selected district. Every year we are accumulating more of these district monographs, which ought, in their turn, to be used for compiling regional monographs dealing with the larger natural areas. In recent years excellent examples of such regional monographs have come from France and from Germany.

The preparation of such monographs would seem to fall within the province of the Ordnance Survey. If this is impossible, the American plan might be adopted. There the Geological Survey, which is also a topographical one, is glad to obtain the services of professors and lecturers who are willing to undertake work in the field during vacations. It should not be difficult to arrange similar co-operation between the Universities and the Ordnance Survey in this country. At present the Schools of Geography at Oxford and at the London School of Economics are the only University departments which have paid attention to the preparation of such monographs, but other Universities will probably fall into line. Both the Universities and the Ordnance Survey would gain by such co-operation. The chief obstacle is the expense of publication. This might reasonably be made a charge on the Ordnance Survey, on condition that each monograph published were approved by a small committee on which both the Universities and the Ordnance Survey were represented.

The information which many other Government departments are accumulating would also become much more valuable if it were discussed geographically. Much excellent geographical work is done by the Admiralty and the War Office. The Meteorological Office collects statistics of the weather conditions from a limited number of stations: but its work is supplemented by private societies which are not well enough off to discuss the observations they publish with the detail which these observations deserve. The Board of Agriculture and Fisheries has detailed statistical information as to crops and live stock for the geographer to work up. From the Board of Trade he would obtain industrial and commercial data, and from the Local Government Board vital and other demographic statistics. At present most of the information of these departments is only published in statistical tables.

Statistics are all very well, but they are usually published in a tabular form, which is the least intelligible of all. Statistics should be mapped and not merely be set out in columns of figures. Many dull Blue Books would be more interesting and more widely used if their facts were properly mapped. I say *properly* mapped, because most examples of so-called statistical maps are merely crude diagrams and are often actually misleading. It requires a knowledge of geography in addition to an understanding of statistical methods to prepare intelligible statistical maps. If Mr. Bosse's maps of the population of England and

Wales in Bartholomew's Survey Atlas are compared with the ordinary ones, the difference between a geographical map and a cartographic diagram will be easily appreciated.

The coming census, and to a certain extent the census of production, and probably the new land valuation, will give more valuable raw material for geographical treatment. If these are published merely in tabular form they will not be studied by any but a few experts. Give a geographer with a proper staff the task of mapping them in a truly geographical way and they will be eagerly examined even by the man in the street, who cannot fail to learn from them. There presentation of the true state of the country in a clear, graphic and intelligible form is a patriotic piece of work which the Government should undertake. It would add relatively little to the cost of the census, and it would infinitely increase its value.

The double lack—the lacunæ in the information and the absence of adequate geographical treatment of such material as there is—makes the task of studying the huge natural divisions which we call continents a very difficult and unsatisfactory one. For several years in Oxford we have been trying to gather together the material available for the study of the continents, and to make as accurate maps as is possible for geographical purposes. We have adopted uniform scales and methods, and by using equal area projections we have obtained comparative graphic representations of the facts. We hope before the end of the year to issue maps of the physical features, vegetation, and rainfall of each continent and other maps of the World. These are being measured, and I hope will yield more reliable quantitative information about the World and its continents than we possess at present.

With such quantitative information and with a fuller analysis of the major natural regions it ought to be possible to go a step further and to attempt to map the economic value of different regions at the present day. Such maps would necessarily be only approximations at first. Out of them might grow other maps prophetic of economic possibilities. Prophecy in the scientific sense is an important outcome of geographical as well as of other scientific research. The test of geographical laws as of others is the pragmatic one. Prophecy is commonly but unduly derided. Mendelyeff's period law involved prophecies which have been splendidly verified. We no longer sneer at the weather prophet. Efficient action is based on knowledge of cause and consequence, and proves that a true forecast of the various factors has been made. Is it too much to look forward to the time when the geographical prospector, the geographer who can estimate potential geographical values, will be as common as and more reliable than the mining prospector?

The day will undoubtedly come when every Government will have its Geographical-Statistical Department dealing with its own and other countries—an information bureau for the administration corresponding to the Department of Special Inquiries at the Board of Education. At present there is no geographical staff to deal geographically with economic or administrative matters. Yet the recognition of and proper estimation of the geographical factor is going to be more and more important

as the uttermost ends of the Earth are bound together by visible steel lines and steel vessels, or by invisible impulses which require no artificial path or vessel as their vehicle.

The development of geographical research along these lines in our own country could give us an Intelligence Department of the kind which is much needed. If this were also done by other states within the Empire, an Imperial Intelligence Department would gradually develop. Thinking in continents, to borrow an apt phrase from one of my predecessors, might then become part of the necessary equipment of a statesman instead of merely an after-dinner aspiration. The country which first gives this training to its statesmen will have an immeasurable advantage in the struggle for existence.

Our universities will naturally be the places where the men fit to constitute such an Intelligence Department will be trained. It is encouraging, therefore, to see that they are taking up a new attitude towards geography, and that the Civil Service Commissioners, by making it a subject for the highest Civil Service examinations, are doing much to strengthen the hands of the universities. When the British Association last met in Sheffield geography was the most despised of school subjects, and it was quite unknown in the universities. It owed its first recognition as a subject of university status to the generous financial support of the Royal Geographical Society and the brilliant teaching of Mr. Mackinder at Oxford. Ten years ago Schools of Geography were struggling into existence at Oxford and Cambridge, under the auspices of the Royal Geographical Society. A single decade has seen the example of Oxford and Cambridge followed by nearly every university in Great Britain, the University of Sheffield among them. In Dr. Rudmose Brown it has secured a traveller and explorer of exceptionally wide experience, who will doubtless build up a Department of Geography worthy of this great industrial capital. The difficulty, however, in all universities is to find the funds necessary for the endowment, equipment, and working expenses of a Geographical Department of the first rank. Such a department requires expensive instruments and apparatus, and, since the geographer has to take the whole world as his subject, it must spend largely on collecting, storing, and utilising raw material of the kind I have spoken of. Moreover, a professor of geography should have seen much of the World before he is appointed, and it ought to be an important part of his professional duties to travel frequently and far. I have never been able to settle to my own satisfaction the maximum income which a Department of Geography might usefully spend, but I have had considerable experience of working a department with an income not very far above the minimum. Till this year the Oxford School of Geography has been obliged to content itself with three rooms and to make these suffice not merely for lecture-rooms and laboratories, but also for housing its large and valuable collection of maps and other materials. This collection is far beyond anything which any other university in this country possesses, but it shrinks into insignificance beside that of a rich and adequately supported Geographical Department like that of the University of Berlin. This fortunate department has an income of about £6000 a year and an

Institute built specially for its requirements at a cost of over £150,000, excluding the site. In Oxford we are only too grateful that the generosity of Mr. Bailey, of Johannesburg, has enabled the School of Geography to add to its accommodation by renting for five years a private house, in which there will temporarily be room for our students and for our collections, but where we can never hope to do what we might if we had a building specially designed for geographical teaching and research. Again, Lord Brassey and Mr. Douglas Freshfield, a former President of this Section, have each generously offered £500 towards the endowment of a professorship if other support is forthcoming. All this is matter for congratulation, but I need hardly point out that a professor with only a precarious income for his department is a person in a far from enviable position. There is at present no permanent working income guaranteed to any Geographical Department in the country, and so long as this is the case the work of all these departments will be hampered and the training of a succession of competent men retarded. I do not think that I can conclude this brief Address better than by appealing to those princes of industry who have made this great city what it is to provide for the Geographical Department of their university on a scale which shall make it at once a model and a stimulus to every other university in the country and to all benefactors of universities.

THE DEVELOPMENT OF THE INLAND WATERWAYS OF THE UNITED KINGDOM.

By H. J. Peddie.

In the *Magazine* for June last I described the remarkable development of the inland waterways of Central Europe, and in the present paper I desire to indicate how the inland waterways of the United Kingdom could be developed to great national advantage. It may be pointed out in the first instance, that whilst the inland waterways of England and Ireland admit of very considerable development, those of Scotland and Wales, from the mountainous character of these countries, do not admit of any corresponding development. In Scotland the principal work to be accomplished is, the construction of the Mid-Scotland Ship Canal, and the improvement of the Caledonian, the Forth and Clyde, and the Crinan Canals, or alternatively to the latter, the construction of the proposed Tarbert Ship Canal. Some of the large rivers might also be considerably improved and adapted for navigation, in certain cases specially for shallow draft, stern wheel or screw steamers, or motor boats. The inland waterways of Wales do not admit of much improvement or development.

In England and Ireland, however, a well-planned, comprehensive, national system of inland waterways could be carried out, and would prove of great advantage to national commerce and manufactures. Until, however, a thorough and systematic survey and schedule of the water resources, and of the natural and artificial waterways of the country is made, it is impracticable to plan such a national system, or to pass any

reliable criticism on the various schemes which are placed before the public from time to time. With such a survey it would be possible to devise a thoroughly suitable scheme, and to allocate to various districts the water resources of the country, for domestic, manufacturing, irrigation, navigation, and power purposes. The United States of America and some of the European countries are moving in this direction, and in this country a step of considerable importance has been taken by the reports and recommendations of the "Select Committee appointed to consider the Water Supplies (Protection) Bill," and the Canal Commission. The former has issued a Blue Book, making two important recommendations. First, the appointment of a Supreme Central Administrative authority with control over rivers as regards (*a*) protection of water-supplies from pollution, (*b*) collection of information regarding available water-supplies, and (*c*) of information as to the need of water. The second recommendation is the division of the country into watershed areas, with local representative boards, who, subject to the guidance and control of the central authority, would ascertain the water-supplies in their respective areas, husband such supplies, preserve them from pollution, and advise as to their allocation for various purposes. This, so far as it goes, is satisfactory, but it is not sufficient, and the authorities who deal with the water-supplies and their pollution, should also deal with the cognate question of the drainage and sewage of the country. The recommendations of the Canal Commission I will advert to below.

Whilst it is now universally admitted that the permitting of the absorption of a large part of the canal system by the railways was a great economic blunder, and the Canal Commission was appointed to deal with this amongst other matters, it must not be supposed that the canal system of the country can ever compete with the railway system as a whole. The total mileage of canals in the country is only 3906 miles, as compared with 23,074 miles of railways. The net tonnage carried on all the canals is 39·3 million tons, as compared with 414·2 million tons carried by the railways. The latter have ramifications practically all over the United Kingdom, whereas the canal system is confined to certain districts, and even if the whole of the 1138 miles of railway-owned canals were taken from them and made independent waterways, the transhipment of goods between canal boats and railway wagons, necessary to complete delivery at places where the canals do not reach, would be fatal to successful canal competition with railways. It is only in places where canals can collect and deliver goods independently of the railways, that the former can successfully compete with the latter. In addition to the short mileage and the restricted areas in which canals operate, the slow transit, the primitive methods of haulage and propulsion, the delays at the locks, the expenses of maintenance of these, and the great consumption of water by them—a consumption ever increasing with increasing traffic—and the fact that in mountainous regions a canal system is practically impossible, are all serious drawbacks to successful canal competition with the railways as a whole. No doubt with certain classes of goods, and in many cases, slow transit is no disadvantage, and the disadvantages of the locks and primitive methods of

haulage can be got over, as I will presently show. But, as has been said, the canal system as a whole can never compete successfully with the railway system as a whole. Working, however, in conjunction with improved river routes, and modernised and brought up to date, inland waterways can successfully compete with railways in their own districts, and will prove a national asset of great and ever increasing value.

It is instructive to notice that the net receipts of the independent canals are ·6 millions sterling, and of the railway-owned canals only ·05 million sterling, and the traffic carried by the former 33·3 million tons as against only 6·0 million tons by the latter, whilst the receipts of the independent canals were £216 per mile, as against only £40 per mile of the railway-owned canals, a clear and telling indication of the neglect, and unremunerative character of the railway-owned canals, with, of course, corresponding loss to the public. Judging from the figures given, with a modernised, up-to-date, combined system of river and canal navigation, worked on sound commercial lines, inland waterway navigation would prove thoroughly remunerative, as well as of great commercial utility, and the withdrawal of the canals owned by railways, from them, would free the latter from the incubus of an unremunerative set of artificial waterways.

As regards the Report of the Canal Commission, I need only give its principal recommendations, which are as follows, viz. first, that a central board should be formed and vested with powers to work the canals of the country solely in the interests of the public; second, that a great mid-England national canal, composed of two sections, crossing each other like an × near Birmingham, and composed partly of rivers and partly of canals, should be formed. The cost of this project is estimated at seventeen and a half millions sterling, and the cost of maintenance, etc., etc., at one million sterling per annum. One section of this great waterway would run from the Thames via Birmingham to the Mersey, and the other section from the Severn, also via Birmingham, across the Black Country and the Derbyshire coal-fields, via the Trent to the Humber, thus linking up the Thames and the Severn with the Mersey and the Humber, and with each other, converting Birmingham into an inland port, and giving the mining and manufacturing heart of England direct, easy, and cheap water communication with the seaports on the system, and with the sea itself. Vessels of a minimum capacity of one hundred tons and a maximum capacity of three hundred tons, to suit the requirements of the canal and the needs of the district, would be able to use the canal. This great canal would also have connections with the large canals in the districts which it would traverse, and in course of time these canals would be modernised and brought up to date, thus still further enhancing the advantages of the project. These are so obvious as not to call for any further observations. I may say that this great project dates from 1870, in which year a Midlands gentleman, Mr. Samuel Lloyd, was first attracted to the question of inland water navigation from the Midlands to the coast, and from 1886 to 1896 he was hard at work on the scheme which has now taken shape in the form just described.

The third recommendation of the Canal Commission is to improve rivers and existing canals, so as to give better inland navigation, and the fourth recommendation is, that, on certain conditions, financial aid should be given to the scheme for the projected Mid-Scotland ship canal, and for the improvement of the Caledonian and the Crinan Canals, or in place of the latter, to the proposed Tarbert Canal. The other proposals I do not here deal with.

Excellent as the recommendations of the Commission are, they do not go far enough, and a much more comprehensive scheme, including the national survey before referred to, and dealing with the whole of the inland waterways, and affiliating and co-ordinating the controlling public bodies, proposed by the Canal Commission and the Water Supplies Committee, is required, in order to deal effectively with these all-important matters. Further, in view of what has occurred in the colonies in connection with State railways, whilst it is desirable that the inland waterways should be State-owned, it is not desirable that the State should work them, but that it should lease them under suitable conditions to public companies to be worked by them.

In order to obtain the utmost efficiency and the greatest amount of utility from the inland waterways, it is essential that the very best methods of haulage and propulsion, and a good system of amphibious navigation, be adopted on them. It is now one hundred and eight years since William Symington gave the world its first practical steamboat, *The Charlotte Dundas*, which was specially designed for use on inland waterways. Next year will be the centenary of the building of the famous steamer, *The Comet*, by Henry Bell, who the following year successfully founded commercial steam navigation in the Old World, as Robert Fulton had done in 1807 in the New World. Fulton's efforts, and those of other pioneers before him, were all designed for inland navigation purposes. There is every appearance that now, a little over one hundred years later, amphibious navigation has come to stay, and within a few years is destined to play an important part in the world's commerce. In the *Magazine* for April last I pointed out that its practicability had been fully demonstrated on a small scale in Denmark some fifteen years ago, and the French Government recently adopted M. Ravailler's amphibious Canot automobile war car, which carries four soldiers over land and water. Their continental rivals will soon follow suit, and improvements and developments will rapidly follow.

The amphibious boat is no modern idea. So far back as 1588 one was designed in France, though I cannot learn that it was then brought into use. Exactly one hundred years ago a Mr. Alexander M'Gibbon of Stirling issued a small book, which through the kindness of Mr. J. E. Shearer of that town I have had the opportunity of perusing. In his book Mr. M'Gibbon advocated a method of amphibious navigation in the vale of Menteith, etc. Premising that a horse will draw in a boat a very much greater load than it could do on a roadway or a tramway, he suggested the formation of small canals 2 feet deep by 10 feet wide at top, and 4 feet wide at bottom, along the side of public roadways, and the use of small boats of the capacity of one ton each, towed by

horses. When the canal reached a point where the ground ascended, the boats were to be detached from each other, and run singly on to a four-wheeled cradle and drawn by horses on rails, up an inclined plane of easy gradient to another canal on a higher level, on which they would resume the water journey. There would thus be a series of canals at various altitudes, according to the contour of the ground, connected with each other by these inclined planes, and by this simple but ingenious method small boats would be able to penetrate to all parts of the country, where a sufficient water-supply could be obtained, without requiring locks. To enable the boats to reach farms and other places off the main line of canal, branch canals could be constructed to such places. Mr. M'Gibbon gave elaborate tables to prove the economy and advantages of his scheme, and though it never appears to have been adopted, had it not been for the advent of railways some years later, the scheme might have been advantageously adopted in various districts.

One of the advantages of railways over canals at present is, that it is easy to make branch lines from the main lines to collieries, mines, brick-fields, iron and steel, and other works, but it is a very different matter to make and maintain branch canals to such places. With, however, a good system of amphibious steam or motor barges, etc., the latter could as easily travel over branch and connecting railway lines to their ultimate destinations, and between canals and rivers and canals, etc., as railway wagons can do; and locks, with their delay, heavy maintenance expense, and large water requirements could be dispensed with —the amphibious barges, etc., passing between the different levels on inclined planes, and thus placing inland waterways on an equal footing in these respects with railways. Amphibious navigation is a necessary and valuable adjunct for the proper development of inland waterway navigation, and the sooner it is adopted the better it will be for the country. Our continental rivals are already alive to its value, and though it may possibly encounter as much apathy and even hostility as steam navigation did one hundred years ago, its advent on commercial lines will soon be an accomplished fact.

GEOGRAPHICAL NOTES.

Africa.

The Congo Pygmies.—In a paper on the Land and Peoples of the Kasai Basin (Belgian Congo), which appears in the *Geographical Journal* for July, the author, Mr. E. Torday, records an interesting little observation on the forest pygmies. While he and his party were in the vicinity of Misumba, in the Bushongo kingdom, which lies near the river Sankuru, they came across a village of pygmies. In the region generally the local chiefs have all small groups of pygmies under their suzerainty, the pygmies supplying the chief with game in exchange for vegetable food. In this particular case the pygmies have abandoned the nomadic life, and, settling in the village, have taken to agriculture on

their own account. Though only two generations have elapsed since they left the forest, they are already far superior to other pygmies in stature, though not so big as the Bushongo. Mr. Torday says there can be no question of intermarriage with the Bushongo, who regard the pygmies as "half ghosts," and he ascribes the difference to air, sunshine, and better food. The fact, if it be well-established, is very remarkable, though there seems to be a possibility that the very willingness of the group to settle down to agriculture suggests that they were of mixed origin to begin with. Mr. Torday is, however, of opinion that the forest life has a marked retarding effect on growth, and that it is the change from the forest to the open air which has led to the increase of size.

Southern Nigeria.—We have received the fourth issue (1909) of the *Civil Service List and Handbook for Southern Nigeria*, which contains a large amount of information in regard to the Colony and Protectorate.

The whole area, formed by the union of the old Colony and Protectorate of Lagos with the Protectorate of Southern Nigeria, measures 77,260 square miles, and has an estimated population of six millions. At Lagos a seven-years' mean gives an average rainfall of 75 inches, the wet season lasting from June to October. The Harmattan blows from the middle of December to the middle of February, and this period is thus necessarily one of very small rainfall. The tornado season is from March to June.

The forests of the region, like those of the Gold Coast (see p. 471), fall into several well-defined groups. Along the coast-line, and in the swampy regions which are inundated at high tide, almost pure mangrove forests occur. On passing inland the salt or brackish swamps are gradually replaced by fresh-water swamps, often formed by the overflow of the larger rivers. Here a special type of forest occurs, containing a great variety of species, none of great economic importance. Outside the swamp areas, in regions where the rainfall exceeds 70 inches per annum, the typical evergreen tropical forest occurs. Here are the most important economic species, including mahogany and other valuable timber trees, rubber vines, oil palms, etc. It is, however, a remarkable fact that in Southern Nigeria no great areas of these evergreen forests exist. The native method of agriculture has resulted in the clearing of large tracts of forest. As the cleared land is allowed to go out of cultivation after a year or two, it becomes covered with new arboreal vegetation, but this has entirely a secondary character, consisting of low dense growth, among which a few of the original forest giants, too large to have been cut down, may persist.

As the rainfall diminishes on passing inwards, the evergreen forest becomes gradually mixed with deciduous species, until when the annual fall has dropped to 30-40 inches, the forest becomes of the dry deciduous type. These forests are very open, with an undergrowth chiefly of grass, and are swept by forest fires in the dry season. Here occur trees with edible fruits, and also those yielding minor products, as vegetables, oils, balsam, etc.

Above an altitude of 3000 feet, with the fall in temperature and

the rise in rainfall, a new type of forest appears, the hill evergreen forest.

While, as indicated above, it is in general terms the rainfall which determines the type of forest, yet the soil is also of importance, for a dry and porous soil (*e.g.* laterite) may cause the appearance of deciduous forest in a region of high rainfall.

Agriculture is carried out in the area by very primitive methods. An area of forest land is cleared of trees, the deep layer of vegetable earth being thus exposed. On this maize is planted as an early season crop, to be followed by ground-nuts or beans. In the second year yams or cassava are planted, and in the third a crop of maize or of Guinea corn is obtained. After this the land is allowed to lie fallow for from six to ten years. Though it is not expressly so stated in the *Report*, it would appear that it is only the first year that two crops are obtained, this suggesting a very rapid diminution of fertility. The only implements used in cultivation are the short-handled native hoe and the cutlass, so that it would not appear that anything more than a very superficial stirring of the soil can be carried on. The beginnings of a knowledge of agriculture are, however, shown in the native's habit of sowing a leguminous crop between crops of grain and roots. No manuring is apparently practised, although large numbers of native cattle, pigs, goats, sheep, and fowls occur. The domestic ungulates are small and inferior and are chiefly bred for sacrifice. All the crops named above, with the exception of maize, are grown for home requirements only. Some maize is exported, and also cotton, cocoa, kola, and Para rubber, which are the other crops grown, with some coffee. In addition, gum, copal, timber, palm oil, and palm kernels and rubber are collected in the forest for export, with some fibre.

Polar.

Captain Mikkelsen's Arctic Expedition.—This expedition has been unfortunate in losing its ship, the *Alabama*, which was crushed in the ice in March last, off the coast of East Greenland. The crew were saved and wintered at Shannon Island (see map in the January issue, 1909). The object of the expedition was, it will be remembered, to search for the journals and papers of the Mylius-Erichsen expedition, and the plans were fully detailed in vol. xxv., p. 373. Circumstances had apparently led to some minor modifications, for winter quarters were established at Shannon Island, where a house was built. Last autumn a sledge party succeeded in reaching Lambert Land, and found the body of Brönlund. Before the wreck of the *Alabama*, in March last, Captain Mikkelsen and Mr. Iversen had started for Cape York, which they hoped to reach by way of Peary Channel and the inland ice. If their provisions gave out or the difficulties proved insurmountable, they were to return to Shannon Island, but they left instructions that the remainder of the party were to leave for Europe, if they were not back by August. As they had not come back, the remainder of the party returned to Aalesund in the middle of August in the Polar Sea yacht *Laura*. It is supposed

that Captain Mikkelsen must have succeeded in carrying out his plan of reaching Cape York.

Commercial Geography.

Trade and Commerce of Liberia.—A Consular Report (Cd. 4962-61) gives some details in regard to Liberia, a region still inadequately known. The Republic covers an area of about 8000 square miles, and even in this relatively small area there is considerable climatic variation. There is a distinct dry season between December and April, the Harmattan prevailing in January and February. During the dry season the nights are cool. Throughout the rest of the year the humidity is excessive, and rust and mould are very destructive. No reliable records of temperature or rainfall are kept, but the annual rainfall appears to be about 150 inches, and on the coast the average temperature ranges from about 74° F. at 6 a.m. to 88° at noon. The climate is very unhealthy for Europeans, but it is not easy to differentiate between pure climatic causes and secondary causes, such as the absence of sanitation, the difficulty in obtaining fresh food, and the prevalence of mosquitoes and therefore of malaria, all of which have their effect upon public health.

In the absence of any census the population can only be estimated in the roughest manner. There are about fifty persons of British origin, mostly if not all males, and the native population is estimated at 1,500,000 to 2,000,000 persons. There are no transport facilities beyond the primitive method of human carriers. The carriers' load is 60 lbs., and this load is carried for long distances on the head or back. There are no roads, and the tracks in the interior are scarcely a foot wide. The chief exports are cocoa, Calabar beans, cassava, coffee, ginger, rubber, ivory, hides, kola nuts, palm kernels, palm oil, and piassava fibre. To these various others could be added, notably timber, but the forests are quite unexploited. Rubber is the principal industry, and there is no doubt that it exists abundantly in the forests. It is collected in the long dry season, *i.e.* between October and March, and also in the short dry season in August. A rather curious fact, which illustrates the undeveloped state of the trade of the country, is that although fish and the tropical fruits are abundant, yet the local markets are scantily supplied with both, and the prices are not low. The meaning is presumably that as supplies of both are available to every one, neither has any steady market.

The imports are chiefly European manufactured goods, and it is an interesting point that much of the actual trade is in the hand of German merchants, although the articles imported are largely of British manufacture, *e.g.* Manchester goods, and tinned provisions of British make. The reason seems to be that German merchants study the tastes of the natives with more care.

The Hudson Bay Railway.—According to *Canada*, the contract for the construction of a bridge over the Saskatchewan River at The Pas Mission, the present railhead, has been awarded. This is the first step towards the construction of the Hudson Bay Railway. From this

point to Port Nelson or Port Churchill, on Hudson Bay, the distance is 400 miles. It is understood that the actual construction of the road will be begun next spring.

General.

The Scottish National Exhibition.—In the Scottish Exhibition of National History, Art, and Industry which will be held at Glasgow in 1911, a section will deal especially with the Cartography and Topography of Scotland. Members of the Royal Scottish Geographical Society who will furnish details of such maps, books, documents, etc., relating to these subjects as they would be willing to lend, or of the existence of which in other hands they may be aware, will greatly facilitate the formation of a representative collection.

Communications may be sent to George Eyre-Todd, Exhibition Office, 190 West George Street, Glasgow, Hon. Sec.; or to Captain H. G. Lyons, F.R.S., 34 Huntly Gardens, Glasgow.

EDUCATIONAL.

In two recent issues of the *Journal of Geography*, Mr. Douglas Wilson Johnson discusses the subject of map-drawing in schools, and makes some very practical suggestions. He finds that with present methods the results are remarkably unsatisfactory. He has tested the ordinary power of drawing memory-maps on various occasions, as for example with classes of students beginning the study of the higher branches of geography at Harvard University. In a class of forty men, 70 per cent. placed the equator in Northern Africa, or even to the north of Africa. Seventy-five per cent. placed South America directly south of North America. Half the class extended the peninsula of India south of the equator, and Africa as far or further south than South America. Much the same kind of results were obtained with tests applied to teachers of geography. Mr. Johnson thinks that a great part of the difficulty experienced in the drawing of such memory-maps is due to the methods employed in teaching. The impression which the ordinary person has of the outline of a continent is derived not solely from the accurate representation on a globe, but from distorted representations on flat maps, drawn on a great variety of projections, and therefore distorted in a variety of different ways. There is a sense then in which it is true that the more extensive the student's study of maps has been, the more likely is he to have a distorted impression of the continents as a whole. The fact also that the different parts of the world are usually represented on different scales in the same atlas, adds to the difficulty and confusion, and increases the difficulty of combining the continents into one mental picture of the world.

Various methods have been adopted to get over the difficulties connected with memory-maps. Thus a favourite examination "tip" is to

construct geometrical figures as guides for the drawing of the outlines of continents. These geometrical constructions are often very complicated, and take some time both to learn and to draw. Some rather elaborate ones are given, for example, in Elderton's *Maps and Map-drawing*. This method Mr. Johnson opposes strongly, both on account of its artificial nature, and because any one geometrical figure only applies to one particular projection, and this projection must be arbitrarily chosen. He thinks that the emphasis should be laid on the fact that in all maps, whatever the projection, the relation of the parts to the meridians of longitude and parallels of latitude does not change. Thus the relative position of every point in the outline and of every continent as a whole remains the same, no matter how much the general shape of the areas may vary on different projections. There is no doubt, therefore, that emphasis should be laid on this relation in the teaching of memory-maps. Some teachers insist upon the students learning to construct a projection from memory, and then inserting their map on this projection, after having learnt from memory the latitudes and longitudes of a certain number of points. The great difficulty with this method is that the length of time required to construct the projection greatly limits the number of memory-maps which can be drawn. As a simplification of this method, Mr. Johnson suggests that the pupils should be supplied with printed projections, unnumbered, and that they should be made to learn a few leading latitudes and longitudes for each continent. With these and the projection they can construct a map of remarkable accuracy, and as several different types of projection can be supplied, they can be taught to appreciate the amount and nature of the distortion with the common projections. Mr. Johnson gives some very striking illustrations showing the results obtained both by the ordinary method of drawing memory-maps, and by drawing them on printed projections, and the difference is certainly very remarkable, even in maps drawn by the same pupils. There can be no doubt also that the constant drawing of memory-maps on printed projections will teach the pupils those points about the position of the tropics and the equator which many of them never seem to learn from the mere use of atlases. We recommend the articles to the notice of teachers.

NEW BOOKS.

EUROPE.

Cook's Tourist's Handbook for Southern Italy and Sicily (including Rome). With Maps and Plans. London: Thomas Cook and Son. 1910. *Price 4s.*

To the many travellers by Cook's tours in Southern Italy this handbook will be indispensable. It is a concise and useful guide with many special features of practical value. Unfortunately, like most English guides, it is deficient in regard to maps and plans.

ASIA.

Les Indes Néerlandaises. Par Antoine Cabaton. Paris: E. Guilmoto. 1910. *Price 8 francs.*

The author, a professor of the Malay tongues, wrote this book originally for

his students for the purpose of giving them a general idea of the races and customs of the country which they intend to settle in, particulars which settlers usually ignore. He points out that, with the exception of the luminous work of Elisée Reclus (*Géographie universelle*, t. xiv. "Insulinde"), which is twenty-five years old, and two comparatively recent books, there is no French work on the Dutch East Indies. He signalises as the best atlas one by Steemfoort and Siethoff, but a cheaper one by Van Gelder will generally suffice. These are both in Dutch, a language, he says, "qu'on n'apprend guère encore." He considers "the Dutch East Indies a very interesting study. They are extremely favoured by nature, their present possessors furnish a rare example of firm and wise political intelligence, and their system of government is full of instruction for the other colonising peoples of Europe."

M. Cabaton treats his subject in a very instructive and thorough manner, discussing, after a general review of the Dutch East Indies, the physical geography of Java and Madœra; the administrative divisions of Java; the native element; Javanese mentality; Eastern immigrants from Japan, Arabia, and China; the European element in Java; the government of Java; the products of Java, including both native and introduced plants; mines and forests, industry and commerce; exterior possessions; Sumatra and the Riouw Lingga Archipelago; the political and financial condition of Sumatra; Borneo; Celebes and dependencies; the Moluccas and New Guinea; Timor and dependencies; Bali and Lombok.

The author says that Chinese immigrants have brought three great sources of strength to the Dutch East Indies, viz., numbers, wealth, and ability. They have become some of the leading proprietors of Java, owning, in all, lands valued at sixteen millions sterling. Europeans regard their rivalry and luxury with disgust, but their wealth, industry, and business ability are undeniable. With reference to Borneo (of which Britain possesses the northern part), the author considers it "one of the loveliest and richest places in the world. Its soil equals in fertility that of Java and Sumatra, and everything can grow there. In British Borneo, thanks to sufficient labour, the country is covered with rich plantations," but in Dutch Borneo, from a variety of causes, eight-tenths of the land are uncultivated. A good map by V. Huot is appended, the longitudes being numbered from the meridian of Paris.

AMERICA.

Heaton's Annual: The Commercial Handbook of Canada and Boards of Trade Register, Sixth Year, 1910. Edited by Ernest Heaton, B.A. (Oxon.), Barrister-at-Law, and J. Beverley Robinson. Toronto: Heaton's Agency. *Price 5s. post paid.*

This annual contains a unique collection of general and local information regarding the Dominion of Canada, and is indispensable to the business man who has any connection with it. The contents, too varied to admit of summarising, include an official directory, postal guide, financial and banking information, and the like, and a specially valuable section on the Canadian customs tariff and customs law. This is followed by summaries of government reports on agriculture, mining, forests, fisheries, immigration, etc. An extremely interesting feature is the descriptive gazetteer of all towns in Canada, in their commercial aspect, giving railway connections, industries, leading hotels, and special opportunities for investors or settlers. The book is aptly described by the phrase "the Whitaker of Canada."

GENERAL.

National Antarctic Expedition, 1901-1904.—*Magnetic Observations.* Prepared under the Superintendence of the Royal Society. London, 1909.

After a few pages of Preface, by Sir Archibald Geikie, an Introductory Note by L. C. Bernacchi, and a Historical Note by Dr. Chree, the Discussion of the Observations, consisting largely of Tables and Curves, extends to eleven chapters and two appendices. In work of this kind, editing is everything. Not only should the "raw material" of the observations be reduced and tabulated in sufficient detail to be of real use to the expert in all parts of the world, but the significance of the new material in its bearing upon our present state of knowledge ought to be closely considered. In these respects Dr. Chree has admirably fulfilled the functions of the true editor, and has added to the growing literature of Terrestrial Magnetism a memoir of great value. We have space to notice only a few points. The diurnal variation in the magnetic force is of the same type all the year round, and the amplitude is greater in summer than in winter. In the discussion of the disturbances some novel modes of treatment are introduced. For purposes of comparison with the magnetic phenomena at other stations, the disturbance vector must be decomposed into components parallel to axes fixed in the earth. This requires a laborious reduction from the usual local axes, north, west, and vertical. Then the difficult question how to measure a disturbance is investigated. The only satisfactory answer which Dr. Chree can give is to fix attention upon the changes as they are occurring. A comparison is then instituted between the observed Antarctic disturbance and the corresponding disturbances observed at the magnetic stations of Kew, Falmouth, Colaba, Mauritius, and Christchurch. The one positive result arrived at is that at all the stations the vertical component of the disturbance vector is small compared with the horizontal component—a result inconsistent with the hypothesis that the disturbance is due to the action of a body like the sun or to the earth passing through an external field of force. Dr. Chree considers that the inquiry, so far as it goes, offers a promising field of research. In Appendix B, a further comparison is instituted between the Antarctic observations and those simultaneously made in the Arctic and recently discussed by Professor Kr. Birkeland. Here again distinct evidence of synchronism is found when the disturbances in the Arctic regions are of the type which Birkeland assigns to "equatorial perturbations." One of the results of the comparison has been to make Dr. Chree realise even more clearly than before the desirability of much reduced sensitiveness in magnetographs intended for use in Polar regions. Another desideratum is the obtaining of simultaneous complete records for stations in both Polar regions "so situated that the effects of day and night could be adequately brought out." There is no doubt that this memoir opens up in an interesting way new lines of attack on the somewhat baffling problems of the origin and the variations of the magnetic state of the earth.

Maps and Map-Making. Three lectures delivered under the auspices of the Royal Geographical Society by E. A. Reeves, F.R.A.S., F.R.G.S., Map Curator and Instructor in Surveying at the Royal Geographical Society. London: The Royal Geographical Society. 1910. *Price* 10*s. net.*

There is probably no one better qualified to write on the subject of map-making than Mr. Reeves, and the adequate mapping of the world is undoubtedly one of the most pressing questions before geographers at the present time. Mr. Reeves's little work does not profess to be a treatise or text-book on the subject, it only claims to be general and introductory, but nevertheless it is extremely

interesting and suggestive. From a sketch of the history and evolution of the more important surveying instruments, with many illustrations from the Royal Geographical Society's collection, we are led on to consider the development of the early maps of the world through the middle ages to the present day. Finally, we are introduced to modern and more scientific methods, dealing with special maps and elaboration of detail on large scales. Apart from its special interest to the cartographer, this work ought to be of great practical value in the more advanced teaching of geography.

Rambles in Many Lands. By JOHN MACKENZIE. Inverness: The Northern Counties Newspaper and Printing and Publishing Company, Limited. 1910.

Mr. Mackenzie is a professional photographer, and in the course of his profession has visited a great many interesting places and regions both in the old world and the new. This little book gives his impressions of the places visited, which were mostly, more or less, on the ordinary tourist track.

Hydrographic Surveying: Elementary. For beginners, seamen and others. By Commander STUART MESSUM, R.N., Instructor in Elementary Hydrographic Surveying at the Royal Naval College, Greenwich. With 262 Figures and 22 Plates. London: Charles Griffin and Company, Limited, 1910. *Price* 12*s. net.*

This volume is a valuable addition to Messrs. Griffin's series of scientific text-books, and apart from its special practical value to students of nautical surveying ought to be of much interest to geographers and travellers. Commander Messum modestly describes his book as elementary, but it is really a fairly exhaustive treatise on the subject. A most useful preliminary feature of the text-book is the very simple and lucid explanation of the actual use of the sextant, theodolite, and other instruments used in marine surveying. The author goes on to describe the methods of piloting and charting, the sketching of coastlines, taking of soundings, and the many other data that contribute to the perfection of the complete sea-chart. The work appears throughout to be written with the practical efficiency of an expert, and the numerous diagrams and sketch charts effectively illustrate the various problems dealt with.

BOOKS RECEIVED.

Mysterious Morocco and how to Appreciate it. (Travellers' "Vade Mecum" Series of Handbooks.) By H. J. B. WARD, B.A. Roy. 16mo. Pp. 268. *Price* 2*s.* 6*d.* London: Simpkin, Marshall, Hamilton, Kent and Co., Ltd., 1910.

The South Devon and Dorset Coast. By SIDNEY HEATH. Illustrated. Cr. 8vo. Pp. xvi + 445. *Price* 6*s. net.* London: T. Fisher Unwin, 1910.

Through Tropic Seas. By FRANK BURNETT. With an Introduction by BRAM THOMPSON, M.A. Demy 8vo. Pp. xvi + 173. *Price* 7*s.* 6*d. net.* London: Francis Griffiths, 1910.

L'Epoca delle Grandi Scoperte Geografiche di Carlo Errera. Seconda Edizione rinnovata ed accresciuta, con 22 carte, schizzi e ritratti. Cr. 8vo. Pp. xxiv + 463. *Prezzo Lire* 6·50. Milano: Ulrico Hoepli, 1910.

Great Britain and Ireland. By J. B. REYNOLDS, B.A. (Elementary Regional Geography.) Cr. 8vo. Pp. viii + 184. *Price* 1*s.* 4*d.* London: A. and C. Black, 1910.

Finnish Self-Taught (Thimm's System), with Phonetic Pronunciation. By

Agnes Renfors. Cr. 8vo. Pp. 120. *Price* 2*s.* 6*d.* London: E. Marlborough and Co., 1910.

The Junior Scientific Geography. Book I. The British Isles. By Ellis W. Heaton, B.Sc., F.G.S. Cr. 8vo. Pp. viii + 127. *Price* 1*s. net.* London: Ralph Holland and Co., 1910.

The British Isles in Pictures: A Geographical Reading Book. By H. Clive Barnard, M.A. Cr. 4to. Pp. 64. *Price* 1*s.* 6*d.* London: A. and C. Black, 1910.

Calcutta Faces and Places in Pre-Camera Days. By Wilmot Corfield. Part I. 4to. Pp. 60. *Price* 3*s.* Calcutta: Calcutta Historical Society, 1910.

Manual Labour in S. Thomé and Principe. By Francis Mantero. Translated from the Portuguese. Ry. 4to. Pp. 184. Lisbon: Annuario Commercial, 1910.

Hunting Trips in Northern Rhodesia. By D. D. Lyell, F.Z.S. Ry. 4to. Pp. xii + 188. London: Horace Cox, 1910.

Topologie. Etude du Terrain. Service Géographique de L'Armée. Par Le Général Berthaut. Tome I. and II. 4to. Pp. ix + 674. Paris: Imprimerie du Service Géographique, 1910.

The Advanced Class-Book of Modern Geography: Physical—Political—Commercial. By William Hughes, F.R.G.S. New and Revised Edition, with nine coloured Maps. Cr. 8vo. Pp. xvii + 866. *Price* 4*s.* 6*d.* London: George Philip and Son, Ltd., 1910.

Derbyshire. By H. H. Arnold-Bemrose, Sc.D., F.G.S. (Cambridge County Geographies.) With Maps, Diagrams, and Illustrations. Cr. 8vo. Pp. x + 174. *Price* 1*s.* 6*d.* Cambridge: University Press, 1910.

Life and Wild Sport in India. By Major Wilkinson (an Officer of the Indian Army). Cr. 8vo. Pp. 113. *Price* 6*d.* London: The Southern Publishing Co., Ltd., 1910.

Jungle Byways in India: leaves from the Note-Book of a Sportsman and a Naturalist. With numerous Illustrations by Author and Others. By E. P. Stebbing. Demy 8vo. Pp. xxvii + 306. *Price* 12*s.* 6*d. net.* London: John Lane, The Bodley Head, 1910.

Outlines of Geologic History with especial Reference to North America. A series of Essays involving a discussion of Geologic correlation, presented before Section E. of the American Association for the Advancement of Science in Baltimore, December 1908. Symposium organised by Bailey Willis. Compilation edited by Rollin D. Salisbury. Demy 8vo. Pp. viii + 306. Illinois: The University of Chicago Press, 1910.

Echoes of Sport. By Hilda Murray (of Elibank). With some Illustrations by Friendly Cameras. Cr. 8vo. Pp. xii + 167. *Price* 5*s.* 6*d. net.* London: T. N. Foulis, 1910.

The True History of the Conquest of New Spain (Hakluyt Series). By Bernal Diaz del Castillo. Vol. 3. From the only exact copy made of the Original Manuscript. Edited and Published in Mexico by Genaro Garcia. Translated into English, with Introduction and Notes, by Alfred Percival Maudslay, M.A. With Maps and Plans. Demy 8vo. Pp. 36. London: Hakluyt Society, 1910.

Rainfall of India. Nineteenth year, 1909. Calcutta, 1910.

Report of the Progress of the Ordnance Survey to the 31st March 1910. London, 1910.

The Witham and the Ancaster "Gap": A Study of River Action. By F. M. Burton, F.G.S., F.L.S. London: A. Brown and Sons, 1910.

Neuvième Congrès International de Géographie: Compte Rendu des Travaux du Congrès. Publié par ARTHUR DE CLAPARÈDE. Tome II., *Travaux Scientifiques.* Genève, 1910.

Official Year Book of the Commonwealth of Australia, 1901-1909, *and Corrected Statistics for the Period* 1788 to 1900. Melbourne, 1910.

The Edinburgh University Calendar, 1910-11. Printed and published for the University. Edinburgh: James Thin, 1910.

The following Diplomatic and Consular reports have been received:—Trade of Piræus, 1909, (4484); Trade and Commerce of Oporto, 1909, (4486); Trade of Bahia, 1909, (4488); Trade of Chungking, 1909, (4489); Trade of Kinkiang, 1909, (4490); Trade of Calais, 1909, (4491); Trade of Thessaly, 1909 (4492); Trade of Kerman, 1910, (4493); Trade of Baden, 1909, (4494); Trade and Commerce of Beirut, etc., 1909, (4496); Trade of Wuchow, 1909, (4497); Trade of Mexico, 1909, (4498); Trade and Commerce of Philadelphia, 1909, (4499); Trade of Formosa, 1909, (4500); Trade of Chinde, 1909, (4501); Trade of Honduras, 1909, (4503); Trade of Dairen, 1909, (4504); Trade and Commerce of Portland, etc., 1909, (4506); Trade and Commerce, etc., of Chicago, 1909, (4507); Trade of Constantinople, 1909, (4495); Trade of Society Islands, 1909, (4502); Trade of Tientsin, 1909, (4505); Trade of Chinan, etc., 1909, (4508); Trade of Morocco, 1908, (4509); Trade, etc., of Coquimbo, 1909, (4512); Trade of Basra, 1909, (4513); Trade, etc., of Galveston, 1909, (4425); Trade of Iquque, 1909, (4510); Trade of Japan, 1909, (4511); Trade of Leipzig, 1909, (4514); Trade of Venezuela, etc., 1908-9, (4515); Trade etc., of Marseilles, 1909, (4516); Trade, etc., of Pomerania, 1909, (4517); Trade of Santa Marta, 1909, (4518); Trade of Yokohama 1909, (4519); Trade, etc., of Barcelona, 1909, (4520); Trade, etc., of Hamburg, 1909, (4521); Trade of Iquitos, 1909, (4522); Trade, etc., of Santa Catharina, 1909, (4523); Trade of Corsica, 1909, (4524); Foreign Trade of Port of Santos, 1909, (4525); Trade of Vilayet of Aleppo, 1909, (4526); Trade, etc., of Gothenburg, 1909, (4527); Trade of Togoland, 1909, (4528); Trade of Hankow, 1909, (4529); Trade of Canton, 1909, (4530); Trade of Amoy, 1909, (4531); Trade, etc., of Denmark, 1909, (4532); Trade, etc., of Moscow, 1909, (4533); Trade, etc., of Rosario, 1909, (4534); Trade of Finland, 1909, (4535); Finances of Italy, 1909, (4536); Trade, etc., of Odessa, 1909, (4537); Trade, etc., of Trebizona, 1909, (4538); Trade and Commerce of Norway, 1909, (4539); Trade of Valparaiso, 1909, (4540); Trade and Commerce of Düsseldorf, 1909, (4541); Trade and Commerce of New Orleans, 1909, (4542); Trade of Samoa, 1909, (4543); Trade of Erzeroum, 1909, (4545); Trade and Commerce of Dunkirk, 1909, (4548); Trade of Kiungchow (Hoihow), 1909, (4549); Trade of Lombardy, 1909, (4544); Trade, etc., of Lecce, 1909, (4546); Trade and Commerce of Rio Grande do Sul, 1909, (4547); Trade and Commerce of Chienamai, 1909, (4550); Trade of St. Petersburg, 1909, (4667); Trade of Ningpo, 1909, (4552); Trade and Commerce of Leghorn, 1909, (4553); Trade of Alexandria, 1909, (4554); Trade of Swatow, 1909, (4555); Trade of China, 1909, (4556); Finances of Austria-Hungary, 1909-10, (4557); Agriculture of Portland, Oregon, etc., 1909, (4558); Report of Railways of Colombia, (687).

Colonial Reports—Annual. The Surveys of Brit. Africa, Ceylon, Cyprus, Fiji, Jamaica, Trinidad, Brit. Honduras, (644).

East India (Statistical Abstract). Statistical Abstract Relating to British India from 1899-1900 to 1908-9. Forty-Fourth Number. Cd. 5345. *Price* 1*s.* 3*d.* 1910.

Statistical Abstract for the United Kingdom in each of the last Fifteen Years, from 1895-1909. Fifty-Seventh Number. Cd. 5296. *Price* 1*s.* 8*d.*

Publishers forwarding books for review will greatly oblige by marking the **price** *in clear figures, especially in the case of foreign books.*

NEW MAPS.

EUROPE.

ORDNANCE SURVEY OF SCOTLAND.—The following publications were issued from 1st to 31st July 1910 :—

Six-inch and Larger Scale Maps.—Six-inch Maps (Revised). Quarter Sheets, with contours in blue. Price 1s. each. *Ayrshire.*—27 NE. ; 30 NW. With contours in black. Price 1s. each. *Ayrshire.*—43 SE. ; 45 SE. ; 46 NE. ; 62 NW. ; 63 NW. ; 66 SE. ; (69 SW. & 69 SE.).

1 : 2500 Scale Maps (Revised), with Houses stippled, and with Areas. Price 3s. each. *Ayrshire.*—Sheets I. 7, 11, 12 ; II. 9 ; III. 3 ; VI. 4, 8, 12 ; VII. 13 ; VIII. 16 ; IX. 9, 10, 14 ; X. 8 ; XI. 2, 3 ; XII. 1, 2, 3, 13 ; XIII. 1, 3 ; XVI. 4, 5. Sheets I. (4 & 3) ; IX. 6. Price 1s. 6d. each.

Note.—There is no coloured edition of these Sheets, and the unrevised impressions have been withdrawn from sale.

ORDNANCE SURVEY OF SCOTLAND.—The following publications were issued from 1st to 31st August 1910 :—

One-inch Map (third edition, engraved, in outline).—Sheet 86. Price 1s. 6d.

Six-inch and Larger Scale Maps.—Six-inch Maps (Revised) Quarter Sheets, with contours in blue. Price 1s. each. *Ayrshire.*—29 NE. ; 33 SE. With contours in black. Price 1s. each. *Ayrshire.*—39 NE. ; 40 NW. ; 45 SW. ; 47 NW. ; 50 SW. ; 51 NE. ; 56 SW. ; 56 SE. ; 57 NE., 57 SW., 57 SE.

1 : 2500 Scale Maps (Revised), with Houses stippled, and with Areas. Price 3s. each. *Ayrshire.*—Sheets I. 8, 15, 16 ; III. 4, (7 & 11), 8, 12, 16 ; IV. 12, 13, 14, 16 ; VI. 16 ; VII. 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 16 ; VIII. 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 ; IX. 5, 13 ; XI. 4 ; XII. 4. Sheets V. 9, (13 & 14), (15 & 16) ; VIII. 4 ; IX. 1. Price 1s. 6d. each. *Lanarkshire.*—Sheets XLIX. 3, 4, 8.

Note.—There is no coloured edition of these Sheets, and the unrevised impressions have been withdrawn from sale.

ADMIRALTY CHARTS, SCOTLAND.—Little Loch Broom, surveyed by Captain C. K. Simpson, R.N. 1908. Scale 1 : 14,690. Published June 1910. Number 2407. Price 3s. *Admiralty Office, London.*

Brodick Bay, surveyed by Captain C. K. Simpson, R.N. 1908. Scale 1 : 10,610. Published July 1910. Number 838. Price 2s. *Admiralty Office, London.*

AMERICA.

ROCKY MOUNTAINS.—Between Lat. 51° and 53°. Scale 1 : 253,440 or 4 miles to an inch. R. E. Young, D.L.S., Chief Geographer. 1910. Two sheets. *Department of the Interior, Ottawa.*

UNITED STATES SURVEY.—Topographical sheets on scale of 1 : 31,680. California, 6. On scale of 1 : 62,500 or about 1 mile to an inch. Illinois, 2 ; Iowa, 1 ; Kentucky, 4 ; Michigan, 1 ; Minnesota, 1 ; New Hampshire, 1 ; New York, 1 ; Ohio, 10 ; Oklahoma, 2 ; Pennsylvania, 2 ; Texas, 2. On scale of 1 : 125,000 or about 2 miles to an inch. Colorado, 1 ; Idaho, 1 ; Montana, 1 ; New Mexico, 1 ; Oklahoma, 2 ; Texas, 2 ; Wyoming, 1. 1909-1910. (The figures after the name of each State indicate the number of sheets received.) Price 5 cents. each sheet.

United States Geological Survey, Washington, D.C.

QUEBEC.—Topographical Map. Scale 1:63,360 or 1 mile to an inch. Sheet No. 24, Chateauguay. (Department of Militia and Defence, Ottawa, 1909.)

Geographical Section, General Staff, London.

AFRICA.

BASUTOLAND.—General Staff Map on scale of 1:250,000 or about 4 miles to an inch. Sheet 129-J., Maseru. 1910. Price 1s. 6d.

Geographical Section, General Staff, London.

EAST AFRICA PROTECTORATE.—General Staff Map on scale of 1:62,500 or about 1 mile to an inch. Nairobi sheet. 1910. Price 1s. 6d.

Geographical Section, General Staff, London.

EAST AFRICA PROTECTORATE.—General Staff Map on scale of 1:125,000 or about 2 miles to an inch. Nairobi sheet. 1910. Price 2s.

Geographical Section, General Staff, London.

SIERRA LEONE.—General Staff Map on scale of 1:250,000 or about 4 miles to an inch. Sheets 59-M., Falaba; 59-N., Tembikunda; 59-T., Kissi; 71-A., Bandajuma; 71-B., Gola. 1910. Price 1s. 6d. each sheet.

Geographical Section, General Staff, London.

ASIA.

INDIAN GOVERNMENT SURVEYS:—

Railway Map of India. 1910. Scale 1:5,068,800 or 80 miles to an inch.

Railway and Canal Map of India. 1909. Scale 1:2,027,520 or 32 miles to an inch. Complete in 6 sheets.

India and Adjacent Countries. Scale 1:2,027,520 or 32 miles to an inch. Fourth Edition, 1908. Complete in 6 sheets.

India and Adjacent Countries. 1909. Scale 1:1,000,000 or about 16 miles to an inch. Sheets—No. 10. Part of Persia and Persian Gulf; No. 54. Parts of Punjab, Rajputana, &c. Price 1 rupee each sheet.

India and Adjacent Countries. 1909. Scale 256 miles to an inch.

Eastern Bengal and Assam. 1910. Scale 1:1,000,000 or about 16 miles to an inch. In two sheets. Price 1 rupee 8 annas.

Punjab. Scale 1:253,440 or 4 miles to an inch. Sheet No. 53-B. 1910. Price 1 rupee.

United Provinces. Scale 1:253,440 or 4 miles to an inch. Sheet 53-P. 1910. Price 1 rupee.

Survey of India Office, Calcutta.

AUSTRALIA.

QUEENSLAND.—Sketch Map of Herberton and Chillagoe Gold and Mineral Fields. Compiled from official and other sources under the supervision of W. H. Greenfield. 1909. Scale 6 miles to an inch. Price 1s. 6d.

Geological Survey Office, Department of Mines, Brisbane.

VICTORIA.—Geological Map constructed and engraved at the Department of Lands and Survey, Melbourne, under the direction of A. J. Skene, M.A., Surveyor-General of Victoria. Scale 8 miles to an inch. Geologically compiled and coloured by Arthur Everett, under the superintendence of R. A. F. Murray, F.G.S., London, ex-Government Geologist, and James Stirling, F.G.S., Government Geologist for the State of Victoria. Eight sheets.

Mining Department, Melbourne.

THE SCOTTISH

GEOGRAPHICAL

MAGAZINE.

EXPERIMENTS IN GEOGRAPHICAL DESCRIPTION.[1]

(With Figures.)

By Prof. W. M. Davis of Harvard University.

The particular subject on which I wish to address you to-day concerns, as you might expect, the study of land forms, and more especially the manner in which land forms may be effectively described by mature observers, so that they may be appreciated by mature readers. Let me consider with you whether it is desirable and practicable to make at least some approach to systematic methods in describing the landscapes with which every geographer has to deal in the narrative of his travels, or in the account that he gives of particular areas in his regional studies. My own answer to this question is decidedly in the affirmative, and I propose to illustrate at once the need and the value of some sort of systematic method by the rather invidious device of giving an example of unsystematic description, taken from the first geographical journal on which my hand happened to fall after the intention to cite such an example was formed. The following abstract, therefore, presents all the statements concerning the structure and form of a certain mountain range, in the order in which they are presented in the essay referred to; but distances, directions, and other details are changed so that the source of the abstract can hardly be identified, and a considerable amount of general description that is aside from my purpose is omitted:—

"The mountain mass, entirely isolated and having a very remarkable geological constitution, is a high range, which rises abruptly at its northern end in the form of a great escarpment, surmounting the plain

[1] Presidential Address delivered to the Association of American Geographers on December 30, 1909, and first published in the *Bulletin of the American Geographical Society* for June 1910, with some modifications. Reprinted in a slightly abbreviated form.

by some 3000 or 4000 feet; the range continues in an almost direct course to the south for about forty miles. The summit is of very difficult access, the rocky wall being nearly vertical and mostly bare for the uppermost 1500 feet. There is said to be no deep pass through the range. At an elevation of 2000 or 3000 feet there are grassy benches. On all sides the crests are very steep, with altitudes of from 4500 to 6000 feet; the culminating point rising to 6300 feet. The crest is not continuous. Erosion has dissected the top of the mountain into a multitude of knobs and small plateaus. The entire range is formed of sandstones, inclined in general at an angle of 45°, and trending like the range from north to south. The sandstones rest on granite, which reaches an altitude of 1900 feet at the village of Blank; while near River So-and-so the sandstones are seen at an altitude of 1200 feet. On certain lower terraces, horizontal sandstones are deposited. The range has the appearance of constituting the eastern limb of an anticline, but it is difficult to explain in what way erosion has removed the sandstones of the western limb from the plain, since they form a heavy body in the range. Deep V-shaped valleys, parallel to one another, veritable torrent beds, are seen in large number on the eastern flank. After reaching the foot of the range, at an altitude of 1000 feet, the torrents become quiet streams."

Part of this description is rather baffling. For example, what is the general form of the top of the mountain, in which erosion has produced a multitude of knobs and small plateaus? On reaching this statement, after having previously read that the summit is of difficult access, the upper rocky walls being nearly vertical and the crest very steep on all sides, one might make the provisional inference that the mass was of horizontal structure, like a lava-capped mesa; but this inference is not consistent with the earlier statement regarding the well-defined north-south trend of the range, and it is explicitly contradicted by reading, a little further on, that the mountain is formed of inclined sandstones. One must feel rather vexed not to be told at once in which direction the sandstones dip; for until such information is given, the reader has to keep two pictures floating in his mind; one of an east-dipping monoclinal range, the other of a west-dipping monoclinal range. But he may throw away the second picture after reading a little farther and coming to the comparison of the range with the eastern limb of an anticline, of which the western limb is lost. This is the only indication given by the observer that the dip of the sandstones is to the east. The absence of the western limb of the postulated anticline tempts the reader to suppose that the range, instead of being part of an anticline, is really an east-tilted and dissected fault-block; even though the observer, after he has himself discredited the suggestion of anticlinal structure, says nothing about this manifest possibility. Theoretical discussion is therefore as fragmentary as the record of observation. In fine, the more carefully one reads the article, the more one is impelled to say that certain important items are omitted; that such items as are mentioned are introduced in no apparent order; and that the method of

treatment is uneven, arbitrary and accidental, being explanatory in one part and empirical in another.

By rearranging the facts presented, the reader may form a more systematic description. In the absence of explicit statement to the contrary, normal erosion is naturally assumed to have caused whatever changes have been produced during the development of the existing form from the initial form. The systematic description may then proceed as follows: The range, trending north and south, with altitudes of from 4500 to 6000 feet, is a monocline of heavy sandstones which dip eastward, and which are underlaid by granite along the western flank. The northern termination is a high cliff; the southern end is left undescribed. (Whether the initial form of the mass was a tilted block or not must be left undecided, because no sufficient account is given by the observer either of the constitution or of the form of the lower ground from which the range rises.) The crest is somewhat dissected but not deeply notched; the eastern flank is well dissected by consequent streams; the western flank is presumably more or less ravined by obsequent streams. On the whole, the stage of erosional development may be provisionally regarded as submature or mature.

It is tantalising to read of the grassy benches at altitudes of 2000 or 3000 feet, and not to be told on which side of the range they occur, or how they are related to the structure of the mass; possibly they are granite benches on the western flank. One must discount the statement regarding the nearly vertical slope of the upper rocky walls, because vertical walls are altogether improbable, if not impossible, on the back slope, and are hardly possible even on the front slope of a monocline. Uncertainty must also remain regarding the piedmont terraces: perhaps they are remnants of a sandstone formation that once had a greater horizontal extension; but this can not be determined because of the vagueness of the phrase: "On certain lower terraces, horizontal sandstones are deposited." Inasmuch as erosion is explicitly mentioned as having affected the crest of the range and implicitly suggested as having ravined the eastern flank, it is unfortunate that its effects on the western escarpment and around the base of the range are passed over in silence. Uneven description of this kind is disappointing.

The point to be emphasised is that the description prepared by the observer would be much more easily apprehended by the reader if it had been orderly instead of disorderly, and thorough instead of fragmentary. Immediately following the introductory statement concerning the occurrence of a high and isolated range, trending north to south, one must wish to know its general structure: namely, that it is a monocline of heavy sandstones, dipping eastward, with a foundation of granite exposed in the western flank. After exploration is finished, the preparation of brief and explicit statement of this kind surely imposes no great burden on the observer; and as surely it gives great aid to the reader. Brief suggestion as to the initial form of the mass and as to the amount of change that it has suffered since its uplift would be helpful, because the reader could then, as it were, accompany the observer in his attempt to give an explanatory account of the present form. If erosion has gone so

far that the initial form is altogether uncertain, an explicit statement to that effect should be made. Normal erosion being understood to be the process engaged in carving the mass to its present form, various details regarding the dissection of the crest, the steepness of the upper slopes, and the ravining of the flanks, may be easily added in the latter part of the description in orderly fashion: and as easily apprehended. If the observer, on seeing the ravines in the eastern flank, hesitates to call them "consequent," because of the vague possibility of some other origin, he may immediately solve this difficulty by calling them "apparently consequent": and the reader will at once catch his meaning, and also his uncertainty regarding it. If the observer hesitates to assert definitely that the mass was initially a tilted block, he may say it looks "as if" it had been uplifted as a tilted block, provided that that is really his best interpretation of the facts: and then the reader will find in this guarded statement the clue that he needs in order to gain the observer's point of view, to follow the rest of the description, and to form a good mental picture of the landscape. The essential principles here are, first, that the reader's mental picture cannot be well formed, unless the observer describes what he has seen in terms that are susceptible of definite interpretation: and, second, that the mental picture cannot be easily formed, unless the observer presents the results of his observations in a reasonable order.

Only after a definite description of the landscape has been presented, is it fitting to mention by name subordinate items, such as single villages and individual streams. It is altogether inappropriate to use unknown local names of villages and streams as a means of locating unknown structures and forms. This is a general principle that is too often overlooked. In the absence of all diagrams and maps in the article here considered, the reader gains nothing on being told, before the direction of monoclinal dip is stated, that the foundation granite outcrops near the village of Blank. He profits nothing on reading that the sandstones are seen on the banks of River So-and-so, the relation of the river to the range being unexplained, and even the direction of river flow being unmentioned. Such items may be useful hints to a second traveller on the ground, but they are distractingly irrelevant to a reader at a distance. On the other hand, after a general statement has been given, from which the reader may form a fairly definite conception of the structure and form of the range, it may well be added that at the western base, about so far from the well-defined northern end of the range, and near a large exposure of the foundation granite, lies the village of Blank: or that at the head of a certain obsequent ravine, located in such and such a way and drained by the headwaters of River So-and-so, the sandstones are reached at such and such an altitude.

The article from which these extracts are taken affords a fair sample of the treatment accorded to land forms in most of the leading geographical journals of the world and in most of the books of travel, from which we must learn nearly all that we know about distant lands. If the article here abstracted departs from the average treatment of land forms, it is rather on the side of greater than of lesser fulness of

statement: but here, as well as in the great majority of geographical books and essays, the method of treatment is really no method at all, as far as this division of our subject is concerned. Such articles as those by Bowman on the Bolivian Andes[1] are altogether exceptional in the clearness and fulness of their explanatory treatment. There is very seldom any indication that explorers have had in mind any well-matured plan or standard, in view of which a mountain range or any other form that they come upon should be treated. Geographical essays seldom give us reason for thinking that their authors have had any thorough training in the analysis or the description of land forms: or for thinking that they are aware of the systematic association of parts that is so generally characteristic of the elements of a landscape, or of the reasonable origin of the associated parts by the action of ordinary processes. There is not even any clear indication that the observers are consciously experimenting with any definite method for the better presentation of the facts that they have seen. The random accounts of item after item are usually arranged in indiscriminate order, as if any accidental manner of presentation were all-sufficient. This is truly one of the most disappointing features of the present status of geography. The very sources from which we ought to expect the best material—namely, original narratives in books of travel, and essays in the journals of the great geographical societies—give us records of the kind just cited, in which so important a part of our subject as land forms is, as a rule, treated in an utterly unscientific manner.

The prevailing absence of scientific method for the treatment of land forms may be, on the one hand, taken as a discouragement by those who believe that a systematic method would be helpful: for if disorderly, unscientific methods prevail at so late a time as the present, it must be, one may be tempted to say, because no other can be invented. But, on the other hand, the absence of method may be regarded as an encouragement, because it shows that the field is practically clear for the introduction of any method that will generally commend itself to practical geographers. The latter point of view is to be preferred. Let me, therefore, confidently urge upon all our members who are interested in this aspect of geographical progress to give a share of their time to the invention and development of a thorough-going method for the description of land forms, a method that may find general acceptance through being generally applicable: and to make experimental trial of the method for themselves, and explain it as well as exemplify it in their publications.

As an earnest of my conviction of the importance of this work, allow me to say that I have already made some experiments of this kind myself. You may remember that, two years ago, when we met at Chicago, I had the pleasure of conducting a conference in which the discussion centred chiefly on the possibility of developing and adopting a systematic method for the description of the lands, and in which I advocated the general use of what has been called the method of

[1] *American Journal of Science*, XVIII., 1904, 197-217, 373-402.

"structure, process, and stage" for this purpose. It is my desire to-day to carry the subject of that conference somewhat farther; partly by reviewing what was then accomplished, partly by describing to you an experiment in the same direction that I made in Europe in the summer of 1908.

One of my objects at the Chicago conference was to bring forward various other systematic methods of treating land forms, besides the one with which I was experimenting myself; but no success was reached in this direction. Several members who were present, and several absent members to whom I afterwards wrote, expressed themselves as unprepared to adopt the method of structure, process, and stage in their work; but what impressed me more was that they did not propose any alternative method. Perhaps no sufficient opportunity was given for the presentation of such an alternative; but certainly none was forthcoming, either in discussion or in correspondence. Some members stated explicitly that they preferred to remain free from any limitations: and with a preference for full freedom I have the warmest sympathy. Indeed a wish to profit from the more general introduction of a systematic method does not, to my mind, unwisely interfere with such freedom. Improvements are always in order, and every one must of course feel free to introduce them. There are occasions, however, when some definite method of treatment has to be adopted for a time at least, as when one writes a geographical description of a tract of country, or when one presents the principles of geography to a class of students: and still more when one attempts to teach young geographers the art of geographical description It was particularly with regard to such needs that I was interested to learn the opinions and the practice of my associates. Perhaps the title of the Chicago conference, namely, "Uniformity of Method in Geographical Investigation and Instruction," went too far; and as I am now minded, my object would be better expressed under such a title as "Experiments in the Systematic Description of Land Forms." It is especially that aspect of the subject which I wish to pursue further to-day.

A good test of a method of description is found in its application to new fields. It was, therefore, with much interest that I looked forward two years ago to a journey to Italy in the summer of 1908, when it would be possible to revisit certain districts of which I had had passing glances in the spring of 1899, and to determine how far they could be described according to the method under experiment. But it occurred to me that an adequate and impartial experiment with a method could hardly be secured if the person who had developed it should also be the person who had to apply it. Others of different training ought to make the test. Hence a circular letter[1] was sent to a number of correspondents at home and abroad, indicating a route and a plan of work, and inviting them or such of their advanced students as they could recommend to join me in Italy on June 1st. The success of this plan passed all my anticipations. We were favoured by special permission from the Italian

[1] Cf. this *Magazine*, vol. xxiv. p. 268.

Ministry of War, secured through the kind offices of the American Embassy at Rome, to make field studies even near fortifications and along the frontier. We were allowed to purchase all sorts of maps, not usually on sale, at the Military Geographical Institute in Florence. We were cordially welcomed by scientific colleagues at various points. The members of the party all entered heartily into the spirit of the work proposed, and made a most harmonious even if a variegated troop. The numbers varied from four to forty or more in different parts of the route. The cosmopolitan character of the gathering was its greatest value: for under what conditions could one secure livelier incentive to geographical investigation or make a better test of a proposed method of work, than by visiting choice fields in the company of earnest students of different nationalities and different training, and discussing together the varied landscapes that opened before us. Members who accompanied the party for a week or more included teachers from the universities of Paris, Lyons, Marburg, Genoa, Michigan, Cincinnati and North Carolina, Williams College and the Lyceum of Oran (Algiers), as well as graduates or students from Berlin, Lille, Vienna, Berne, and Cambridge (England): those who were with us for shorter periods represented the universities of Grenoble, Fribourg, and Harvard, the military school of Fontainebleau, and the state normal schools of Salem (Mass.), and Cheney (Wash.).

Our work began on June 1, 1908, at Ancona on the Adriatic (A, Fig. 1), where we studied a late mature coastal plain; and ended on July 18 at Le Puy en Velay in central France; and between times we saw the valley of the Lamone above Faenza (Fa), in the north-east flank of the Apennines, the basins of Florence (F) and of Val d'Arno within the Apennines; the plain of Pisa (P); the beautiful coastal forms of the Riviera Levante between Spezia (Sa) and Genoa (G); the elbow of the Tanaro valley at Bra (B), where the river has been diverted from a former northward to its present eastward course: the lakes of Como (C), Lugano and Maggiore (M), and their associated Alpine valleys, where we discussed the problem of glacial erosion: the huge terminal moraines of Ivrea (Iv), and the glaciated valley of the Dora Baltea above them to Aosta (A); the pass of the Little St. Bernard, by which some of us crossed into France: the French Alps in the vicinity of Grenoble; and west of the Rhone the mountain belt of the Cevennes, formed by the dissection of the south-eastern slope of the central plateau. It may well be imagined that we had much entertainment that was not strictly geographical: yet on the whole we held rather closely to the object of the excursion. One of the most amusing features of the journey was the necessity of using several languages in our daily intercourse: and here the European members of the party had great advantages over the

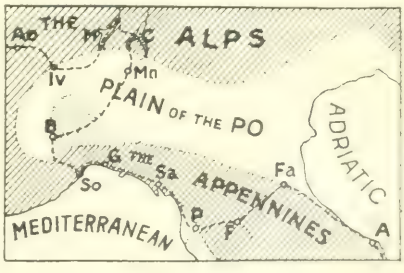


FIG. 1.

Americans by their fluency in other tongues than their own. The determination taken by some of the American members to learn at least one foreign language before making another visit to Europe was not the least valuable lesson of our co-operative efforts.

As in the case of the Chicago conference, the most significant result of the Italian excursion for me was again the prevailing absence among the members of the party of any conscious and matured method for the description of land forms. That the method with which I had been experimenting was not familiar to my European companions was surely not due to any recondite elements in it, for there are none; all its elements are taken from the common experience of geologists and physical geographers. In so far as the method has any novelty, it is to be found in the systematic treatment of well-known elements; and even in this respect it is not so novel as some have seemed to suppose. Its fundamental principles are to be found, for example, in the third edition of Sir Archibald Geikie's "Scenery of Scotland" (1901), where one may read:—

"The problem of the origin of the scenery of any part of the earth's surface must obviously include a consideration of the following questions: (1) the nature of the materials out of which the scenery has been produced; (2) the influence which subterranean movements have had on these materials, as, for instance, in their fracture, displacement, plication, and metamorphism, and whether any evidence can be recovered as to the probable form which they assumed at the surface when they were first raised into land: (3) the nature and effect of the erosion which they have undergone since their upheaval: and (4) the geological periods within which the various processes have been at work, to the conjoint operation of which the origin of the scenery is to be ascribed" (pp. 9, 10).

Here we have the very essence of what is implied under the terms "structure, process, and stage"; and I fully agree that "obviously," as used in the first sentence, is precisely the word with which to introduce what follows. Yet, obvious as these considerations are as regards the origin of scenery, it is seldom that they are completely and systematically employed by geographers in the description of scenery. Their helpful use is furthered by their systematic treatment according to a definite method; and therefore method has here a practical value. Each member of my party knew well enough the various structures and processes involved in the production of natural landscapes, and could explain them item by item: nevertheless, hardly any one had consciously adopted a particular method for presenting the results of his observations regarding the natural combinations of the items, such as occurred in the landscapes that were repeatedly spread before us.

A generally favourable consideration was given to the method of structure, process and stage, during the excursion, but this must not be taken as counting altogether in its favour. A definite method naturally makes headway as against indefinite, unformulated methods: and moreover, as I was the leader and oldest member of the party, my views

probably received a greater consideration than they would have gained if I had been a junior and a follower. Still, all allowances made, the excursion gave me great encouragement, and I resolved to persevere in carrying the development and the application of the method as far as possible: but always in the hopes of meeting other methods, developed by my colleagues: and always with the promise, to myself at least, to make careful trial of other methods as far as I could learn them.

Let me give a few examples of our work, beginning with two excursions in the neighbourhood of Ancona, where sheets 117, 118, 124, 125 of the Grande Carta topografica del Regno d'Italia, 1:100,000, served as local guides. Here the earliest members of the party, a Frenchman, a German Swiss, and an Austro-Galician, were present. The results may be briefly summarised as follows: The north-eastern Apennines serve as the oldland to a dissected coastal plain, some 20 or 30 kilometres in breadth, composed of unconsolidated strata of clay and sand. The dissection has been carried to a stage of late maturity by prevailingly consequent streams with short insequent branches, the largest consequents being those which have been extended across the plain from the Apennine oldland to the sea. The oldland, although not sharply separated from the coastal plain, has a more deformed structure, a greater altitude, and a tendency to a longitudinal rather than to a transverse arrangement of its ridges. The relief of the district is moderate or small, with altitudes of 200 or 250 metres along its inner border, and of from 50 to 120 metres near the coast, where the sea has developed a fully mature line of cliffs which truncate all the seaboard hills in every alignment. The texture of dissection is rather coarse. In consequence of a slight and recent elevation, increasing from zero at the coast to 10 or 20 metres at the inland border of the district, the larger consequent streams have excavated mature flood-plains below the remnant terraces of their earlier valley floors: and during about the same recent period the sea has withdrawn from the maturely aligned cliffs of its former attack and prograded a strand-plain from 200 to 300 metres in breadth, which at the river mouths is broadened in faintly convex deltas of about double this measure. Hence it seems as if the recently revived rivers had rapidly washed so much waste to the sea, that the waves could not immediately dispose of all of it, and therefore deposited a part of it along the shore, thus prograding the strand-plain. These features are graphically summarised in Fig. 2, an imagined bird's-eye view, looking north-west.

The essentials of the above description are, first, that it begins with a general statement from which the reader may immediately infer the total initial structure and form of the district concerned: second, that it proceeds, tacitly implying the action of normal and of marine processes of erosion, to state the stage that each of these processes has reached in the regular progress of its work: and third, that it adds in closing a brief account of the result of a slight interruption of the first cycle of erosion due to a slanting uplift of small amount, and with the cautionary words, *as if*, provisionally suggests the correlated origin of two new features, the terraced valley floors and the prograded strand-plain,

concerning which our brief excursions did not suffice to provide full proof.

Let us consider these points in more detail. From the term, coastal plain, which is given in the first sentence of the description, the initiated reader immediately understands a simple structural mass composed of stratified sediments, deposited on a sea floor when the region formerly stood lower than now, and when the sea had its shore on the flanks of the Apennine oldland; but now revealed as a land area, sloping gently seaward, in virtue of a broad uplift without significant deformation. Even if all this had been explicitly stated, instead of having been only implied in the term, coastal plain, the description would not have been too geological, for every point of the structural statement bears helpfully on the appreciative understanding of the existing landscape, and hence on its proper description. Nothing is introduced simply for the sake of

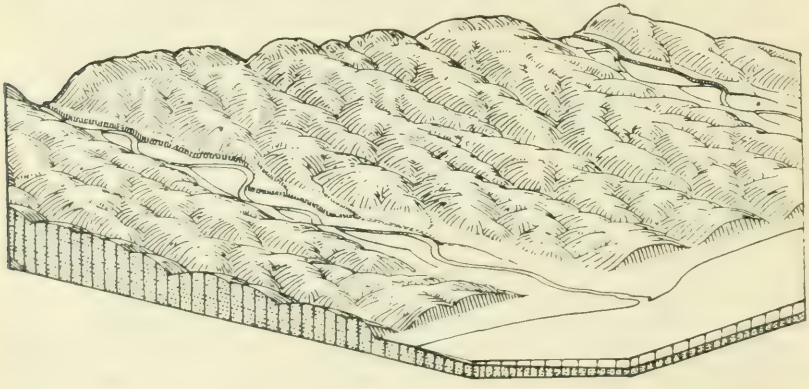


Fig. 2.

its geological interest, however great that may be; even the geological date of the strata concerned is left unmentioned, because this is geographically irrelevant.

It may be noted in passing that the terms coastal plain and coast plain have been used by some geographers to designate platforms of marine abrasion, now uplifted so as to form a littoral lowland. Geographical terminology is so little developed and systematised that no agreement as to the limitation of these and various other terms has yet been reached.

Although a marine coastal plain is in its earliest youth a smooth surface, gently inclining from the oldland to the sea, the first sentence of the description given above includes the significant word, dissected; and with this the reader must immediately pass from the conception of the initial stage of a smooth coastal plain to the later stage of a surface made uneven by the erosion of many valleys. The strata that form the plain are said to be unconsolidated, and this suffices to exclude all outcropping ledges from the present landscape, particularly as the dissection

of the plain is said, in the second sentence, to have reached a late mature stage. All the hill slopes must therefore be conceived as cloaked with a creeping soil. The former shore line, marking the original inner border of the plain, must have lost whatever distinctness it may have had at the time of uplift; and it is indeed to-day hardly to be detected.

For similar reasons, all the streams must be conceived as having thoroughly well-graded courses, and all but the smallest valleys must be pictured as having flood plains of gentle fall. The general pattern of the streams and their valleys is sufficiently indicated by the words, prevailingly consequent and short insequent. These must be taken to mean that the larger streams flow almost directly to the sea in sub-parallel courses about at right angles to the general trend of the plain as a whole; while many small valley-heads branch in various directions from the trunk valleys. The hilly interfluves between the chief valleys must, in a late mature stage, be pictured as having lost something of their initial altitude, and hence, when looked over in the direction of the length of the plain, as no longer rising to a perfectly smooth and gently sloping skyline, but nevertheless as approximating to this form: while the spurs that branch from the axes of the interfluves must be pictured as generally pointing toward the sea and as descending by gentle, graceful, and well-graded slopes into the open valleys. The texture of dissection being described as rather coarse, the hills and spurs must be conceived as having contour lines in flowing curves of rather large radius; and all close-set, sharp-cut ravines must be excluded.

At a late mature stage, the larger extended rivers must of course be pictured as having broad valley floors; and the sea must be imagined as having cut back or retrograded the front border of the plain, so that the sea-board hills are evenly truncated in a long succession of sea cliffs, all standing in accordant line over a well-developed beach. Deltas must be absent. The general picture thus sketched must then be slightly modified by terracing the main valleys and by widening or prograding the beach into a well-developed strand-plain.

The technical terms here employed are few; most of them are almost self-explanatory, but they are all highly significant. Consequent and insequent streams and valleys present elementary and fundamental conceptions in rational physiography. Retrogradation and progradation of a shore line by marine action correspond to degradation and aggradation of a valley floor by a stream: in both cases, the steady action of balanced forces is implied. Surely there can be no sufficient reason that the newly-recognised ideas represented by these newly-introduced terms should be neglected by modern geographers who employ, whenever they can, such innovations as motor-cars, film cameras, and daylight developers. Nor need there be any fear that the mere use of such technical terms as are here suggested will necessarily result in enforcing an unattractive, non-literary style upon geographical descriptions. Attractiveness of style is a matter to be cultivated for and by itself: it is as well worth cultivating in geography as in history; but in neither subject should it involve a sacrifice of truth and efficiency to form and sound. The degree of technicality appropriate in a geographical description will

depend largely on the condition of the readers for whom it is written. As the description presented above is intended for mature geographers, it does not seem to be either unduly technical or unattractively awkward.

It is assumed at the beginning of the description that Apennines and Adriatic are names that every mature geographical reader will know without explanation. No other local names are used in the general physiographic description. But now that the general features of the district have been presented, local names and all sorts of details may be conveniently added, and ontographic relations may be effectively introduced. For example, agricultural villages are found on the broader hills of the dissected interfluves, one of these being Loreto with its famous shrine, standing on a full-bodied spur-crest some four kilometres back from the coast: here pilgrims would appear to yield a larger revenue than farms. Fishing villages lie on the harbourless strand plain, especially near the mouths of the larger valleys; in bad weather the boats are hauled up on the beach or towed into the little rivers. An important trunk railroad and a main wagon road follow the level strand plain for a long distance; branch railroads enter some of the larger valleys, and wagon roads turn up all of them: while roads of less importance enter certain smaller valleys and sidle in zigzags up the spurs to the farming villages on the interfluve hills, or follow the hill crests in passing from one upland village to another. It may be pointed out that Ancona does not belong to the coastal plain; it lies on the northern side of a cliffed promontory of altogether different constitution.

Our second stop was at Faenza, where the valley of the Lamone was examined. It is the work of one of the many streams that extend in apparently consequent fashion from the north-eastern flanks of the Apennines across a piedmont lower land, to the fluviatile plain of the Po, which here replaces the Adriatic Sea. This late mature valley, enclosed by well-dissected uplands of moderate relief, is of particular interest in having an early mature valley of small depth eroded in its floor: that is, we have here the late mature work of an earlier cycle followed by the early mature work of a later cycle: the earlier cycle having been interrupted and the later one introduced by a gentle uplift. I was greatly impressed by the distinctness of these combined features during a trip by rail from Faenza to Florence in 1899, and then resolved to examine them more at leisure at some later season. On going there in 1908 we were well rewarded by a delightful prospect over the valley from a favourable view point up on its western side, where our small party of four spent some profitable and memorable hours in the shade of a group of tall cypresses alongside of a little chapel, sketching, drawing maps and diagrams, and discussing our efforts at systematic description. Then we walked over some of the neighbouring hills, and in the afternoon went by train a short distance farther up the valley for new observations. The results are summarised in Fig. 3, an imagined bird's-eye view, looking north-west.

We thus learned that the valley traverses two piedmont belts of unlike constitution; an inner belt of deformed and somewhat resistant

strata, which trend in general parallel to the extension of the mountains in the background; and an outer belt of weak, bedded clays, dipping gently north-eastward. The inner belt seemed to represent the well degraded border of the Apennine oldland, with respect to which the outer belt had been deposited; and the outer belt was apparently a continuation of the dissected coastal plain that we had seen by Ancona, here descending by straggling hills to the plain of the Po, instead of ending in an evenly retrograded line of sea cliffs. We noted first that in the inner belt of stronger strata the new, early mature valley, incised in the gravel-covered floor of the former, late mature valley, has a well-defined meandering course, with steep-walled amphitheatres in which the inclined strata of the district are well exposed, with sloping spurs sharply trimmed on their up-valley side, and with graceful flood-plain scrolls, systematically placed along the down-valley side of the trimmed spurs. The

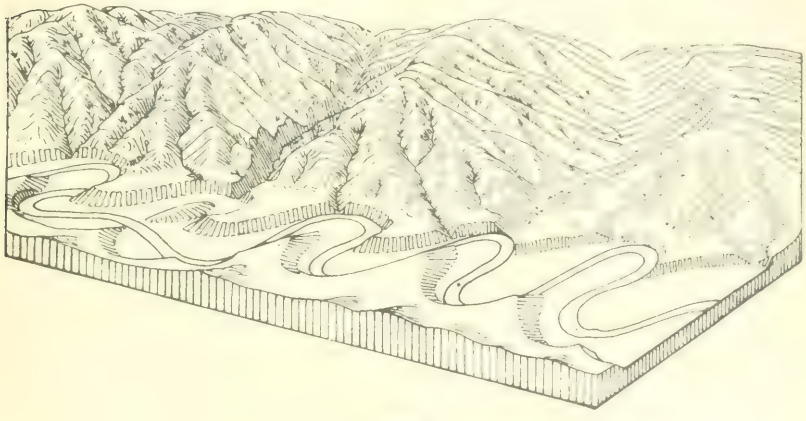


FIG. 3.

depth and breadth of the new valley both decrease up-stream, as if the work of the new cycle were less and less advanced as the mountains are entered. As might be expected, the lateral streams that here come down from the dissected uplands have as yet eroded only narrow, young, steep-walled gorges, with abundant outcrops, beneath the soil-covered slopes of the mature lateral valleys of the earlier cycle; but the lateral gorges are already worn deep enough to enter the main valley at grade. We noted secondly that, in the outer belt of weaker strata, all the features are farther advanced in erosional development, and that at the same time the depth of erosion decreases down-stream. The main valley of the first cycle was here widely opened: the main valley of the second cycle, originally a narrow, incised meandering valley, has now reached the stage of nearly consumed, blunted spurs, so that in this stretch the Lamone wanders freely on a flood plain of greater breadth than that of its meander belt. The valley sides of the lateral streams are here in large part already regraded with respect to the new depth that the valleys have gained; but in consequence of the faint north-eastward dip

of the weak clays, the higher part of the lateral valley sides are often incompletely graded on the north-eastern or outcrop slope, and there exhibit a minute, bad-land dissection; while the south-western or basset slope of the valley sides is smoothly sloping. As the hills decrease in height towards the plain of the Po, the height of the terrace remnants of the earlier valley floor over the newer valley also decreases; and the hills and the terraces vanish together at the border of the fluviatile plain. All this permits one to make a somewhat more definite statement regarding the uplift by which the first cycle of erosion was interrupted and the second introduced; namely, that the uplift seems to have been greater toward the mountains in the background than toward the plain in the foreground: hence, that it apparently involved a gentle north-eastward tilting, such as had been inferred near Ancona. But let it be added at once that the geographer's interest in these inferences as to past uplifts of the Apennines does not spring from any concern on his part as to past events as such, but goes only so far as past events may aid him in the appreciative observation and the effective description of existing land forms.

A railroad and a main highway follow the western terrace remnant of the earlier valley floor; hence they have to cross the newly-incised side valleys on embankments and bridges. I believe that a few small villages lie on the broad floor of the newer valley in the outer belt of weak clays; but in the inner belt of stronger structures, all the villages are on the terrace, the newer valley being too narrow for occupation. On the western terrace near the junction of the two belts lies the village of Brisighella: it was by the chapel just above this village that we spent our morning hours, sketching and writing; and I can strongly recommend this spot as the goal of a physiographic pilgrimage for all who choose to follow.

Thus I might go on describing the smooth-floored basin of Florence, in contrast to the maturely dissected basin of the Val d'Arno; the young lowland and its simple shore-line of elevation and progradation north of Leghorn, in contrast to the complicated mountainous shore-line of the Riviera Levante, with its interesting features due to slight and recent uplift towards Genoa, and corresponding depression towards Spezia; an account of this delightful district was presented to the research department of the Royal Geographical Society in March 1909; it has since then been published in a paper on "The Systematic Description of Land Forms."[1] Much might be said of the maturely established elbow of capture of the Tanaro at Bra; of the superb exhibitions of glacial erosion in the overdeepened troughs of the Alpine valleys, whose terminal basins hold Lakes Como and Maggiore, and of the remarkable pair of glacial distributaries by which the irregular intermediate basin of Lake Lugano was excavated; and so on. It was much to our regret that while the excursion was in the district of the sub-Alpine lakes, where the party had reached nearly a dozen, no member could from conviction present the arguments of the anti-glacial erosionists. We did the best we could

[1] *Geographical Journal*, September 1909, pp. 300-18.

in their absence, but found it impossible to explain the over-steepened trough walls and the numerous hanging lateral valleys of most typical development without accepting a strong measure for glacial erosion. After crossing into France, two professors from the Universities of Grenoble and Fribourg presented their views against wholesale glacial erosion during a visit to the strongly glaciated valley of the Romanche: but it seemed to most of us that their discussion was incomplete and unconvincing.

What with the variety of landscape that we studied and with the variety of training represented in our cosmopolitan party, it will, I think, be agreed that our discussions as to methods of describing land forms must have been profitably extended by the time the excursion closed in the volcanic district of central France. Without giving further account of our results, let me next present certain underlying principles, which appear to be of much importance in this connection.

Whenever an observer attempts to tell what he has seen, so that a landscape or a region may be conceived by his readers, he must describe the observed forms in terms of certain similar forms previously known to him, and hopefully known also to those for whom he writes. It must always be in terms of something previously known that a verbal description is phrased. Hence the most accurate verbal description will be made by that observer who is equipped with the largest variety of previously known type forms. It is important to consider how a young geographer is to obtain such an equipment. The ideally perfect method would be for him to travel about the world and see with his own eyes a great variety of actual forms, from which he might gradually develop a complete series of type forms. Then all other forms could afterwards be described in terms of these types. But this method is manifestly impossible for general application. Some equipment of types may be secured by observation of actual forms; and this beginning may be significantly enlarged by the study of descriptions, pictures, models, and maps of actual forms, as prepared by other observers.

The geographer who follows the empirical method stops here. The geographer who follows the explanatory method goes much farther. He extends and systematises the equipment, thus far gained, by deducing many related forms: and thus fills his mind with a series of more or less ideal forms. It will then be chiefly in terms of the ideal types, largely developed by deduction, familiarised by diagrams, and confirmed or corrected by experience, that his explanatory descriptions of actual landscapes will be phrased. But whether the geographer follow the empirical or the rational method, it will be only in proportion to the completeness with which his series of ideal forms provides him with counterparts of actual forms, that his descriptions of actual landscapes can be true to nature. Only in proportion to the compactness of the terminology in which the ideal forms are verbally expressed, can the observer's descriptions be tersely stated. Only in proportion to the correspondence existing between the ideal forms as conceived and named by the observer and by his reader, will the reader be able to apprehend the observer's meaning.

Imagine, for a moment, that the observer had no mental conception corresponding to what is commonly understood by the word, hill. He would then have to fall back on geometrical terms, such as apex, slope, base, and so on, in order to give an account of a hill when he sees one: and his account would involve awkwardly long paraphrases. Or imagine that when the observer writes down the term, hill, the reader conceives the form that we usually mean by the term, hollow. The reader might mentally conceive a very definite landscape: but it would have little relation to the landscape that the observer had seen.

Let me contrast somewhat further the empirical and the rational use of type forms. In so far as ideal forms of types, with their corresponding terms, are learned partly from direct observation, partly from books and maps and pictures, they may be treated either empirically or rationally. If treated empirically, each type form, however learned by the student, must have been derived from some one's observational experience, without explanatory interpretation. If treated in the explanatory fashion, all the members of the series that are based on induction should be rationally or genetically accounted for as far as possible; while many other members, developed by deduction, will be perfectly understood, even though they are purely imaginary. Under the empirical method, diagrams are unsafe if they depart from the forms of nature, for their departures can hardly be reasonable under a method from which reason is excluded. In support of this strong statement, one need only turn to those fanciful, not to say fantastic landscapes, which have so often defaced the pages of empirical text-books, and which bring together in the most absurd manner all sorts of incongruous land forms. Under the rational method, diagrams, and especially block-diagrams, of which more will be said below, are of immense service; they present the graphic equivalent of deduced forms, whereby another person than the deducer may easily apprehend the intended meaning; and they serve at the same time as graphic definitions of a systematic terminology.

Furthermore, each member of the empirical series has to be learned without consideration of its origin and without explanation of its relation to other forms. Hence to the geographer who employs the empirical series, the corresponding actual forms in a landscape will seem to stand in purely arbitrary association with one another: the occurrence of one element of form can not be logically taken to indicate the associated occurrence of another element: the use of empirical types in the description of actual landscapes or regions requires that every part must be described for itself. On the other hand, all the types in an explanatory series, and particularly the deduced types, are learned in view of their origin by the action of some reasonable process on some specified structure through some limited period of time; and hence type-forms of this kind are necessarily considered in relation to their natural associates. The association may be regional, as in the case of the different parts of an ideal landscape produced by the imaginary action of process on structure to a given stage of development: or the association may be sequential, as in the case of a single element of form followed in imagination along its successive stages of erosional change, from the initial, through the sequential to the ultimate.

As a further contrast, all the many members of an extended empirical series of ideal types must be learned arbitrarily and separately, for no mnemonic aid from explanation attaches to any of them. All the members of an extended explanatory series may be divided into groups, so that the groups themselves shall have certain highly suggestive general relationships, and so that the members of each group shall be treated as systematically interdependent and easily remembered. The development of the explanatory series is immensely aided by the mental process of deduction, which may be carried on by a trained student anywhere and at any time at his convenience; but deduction has no significant place in the preparation of the empirical series, each member of which must originally be learned by some observer, travelling about in the actual world.

Having now pointed out the strong contrasts between these two kinds of type forms, in terms of which the descriptions of natural landscapes and regions must be made, let me hasten to state that no one to-day uses either kind in its purity. The most conservative empiricist will introduce some explanatory types and terms in connection with forms of which the origin is manifest, such as sand dunes, deltas, volcanoes and sea cliffs; while the most determined rationalist will not infrequently find certain actual features which he cannot explain, and for which he can therefore establish no corresponding explanatory types. The difference between the empiricist and the rationalist is therefore not so much in their practice as in their intention. The empiricist introduces explanatory terms as it were by accident; he makes no conscious effort to substitute explanatory types for empirical types, and he has no definite intention of introducing explanation as the most effective means of description. The rationalist, on the other hand, consciously and intentionally strives to find out the origin of every form that he observes, and then tries to describe every observed form systematically in terms of deductively developed type forms. The conservative empiricist condemns the rash rationalist as using a dangerous method, in that it must often be unsafe to describe what one sees in terms of what one does not and cannot see; and in that it is unwisely venturesome to introduce theoretical considerations, which are in many cases necessarily more or less doubtful, instead of holding to direct observation which is essentially safe. The sanguine rationalist criticises the hesitating empiricist as using a blind method, in that it is short-sighted to describe only those things which can be seen with the outer eyes, and unreasonable to omit all those illuminating, explanatory considerations, theoretical though they be, by which so much light is thrown on empirical facts, and by which the way is indicated to many facts which the empiricist overlooks.

My own preference for the explanatory method is so strong that the preceding paragraphs have probably done some injustice to the empirical method. Be this as it may, it seems to me a plain duty to use to the utmost every explanatory relation that we can discover, in so far as it aids us in describing existing landscapes. If the explanation seems assured, it may be used without qualification; if it appears somewhat

venturesome, explicit notice may be given of its insecurity by introducing warning words; for example, "as if." The extraordinary advances made in the understanding of the evolution of land forms in the last half century, particularly those advances made by the government geological surveyors in the arid south-western part of the country, cannot be neglected by the geographers of this new century. The only matter that is questionable is the manner in which the advances shall be practically applied in geographical investigation.

The influence of geology upon geography has indeed been so great that it has come to be a common practice to introduce some statement of geological history, as if in explanation of the origin of land forms, so as to aid in their description; but if geological history is introduced in a more or less haphazard way, it often goes too far in taking the attention away from the geographical present and holding it too long on the irrelevant past; and it often does not go far enough in the way of emphasising the origin of visible forms. The accidental geological explanation is moreover especially deficient in not developing a carefully extended series of deductive types, in terms of which existing forms may be presented. In some way or other such a series of types certainly ought to be developed and carried in the mind as an indispensable equipment for outdoor observation and description. The way that has been most convenient, effective, and helpful in my experience is the one embodied in the method to which I have given the name "structure, process and stage," and of which some illustration has been afforded by the examples presented above from my Italian excursion.

There are certain supplementary considerations regarding the description of land forms to which brief attention may be given. The first concerns what may be called the scale of verbal description, and corresponds to what we familiarly understand by the scale of a map. The well-trained cartographer has had conscious practice in reducing large-scale maps to small scale, and knows that in so doing he must intelligently and critically select the major features for retention and the minor features for omission: he knows also that a really good small-scale map can be made only by reducing it from a well-prepared map of larger scale. What I wish to point out here is that the principle of large and small scales may be applied not only to maps, but to verbal descriptions as well. The kind of maps here considered are not those sketch maps of hasty route surveys, in which large spaces are necessarily left blanks: these would correspond to the verbal reports of hurried excursions in which the writer is well aware that his records are deficient in many respects. It is here a question of more thorough work; that is, of maps for which all necessary surveys have been made, and of descriptions for which all necessary studies have been completed. Then, just as a cartographer must intelligently select certain features to be retained in reducing a large-scale map to a smaller scale, so a geographer, who has already gained sufficient information about a district to complete an elaborate or large-scale description of it, must critically select the major features for retention and the minor features for omission, in compressing his account to the space of small-scale presentation.

In view of this principle, the geographer who wishes to make a well-considered, brief statement concerning a district or region must first learn a good deal more about it than can be contained in a little space. He must then intelligently and critically select the major features for retention and the minor features for omission. He must furthermore carefully study the capacity and the limitations of verbal description, and thus come to perceive that his task in setting forth the features of a district in words is altogether different from that of the cartographer in setting forth the facts graphically. Cartographic representation permits, and indeed requires, the indication of every element of form that is reached by its scale, and gives to each element a definite location and dimension. Hence the cartographic representation of geographical features is very definite. The eye, when first looking over a map, glances from part to part, and apprehends chiefly those elements which by repeated occurrence give character to the district, and those which by reason of exceptional peculiarities stand forth from the others; afterwards, special parts of the map may be more closely examined. On the other hand, verbal description can hardly be understood unless the reader follows the order of presentation chosen by the writer. The description will be fatiguing if it attempts to state the location and size of every element of form; it is therefore best employed to state the generalised characteristics which the eye would perceive in looking over a map, thus giving first emphasis to prevailing features, and only secondary emphasis to less important special features. After the leading facts are thus presented, more elaborate description may well follow, with due attention to what may be called "local colour."

Inasmuch as verbal presentation is necessarily linear, one item following another, emphasis is automatically given to those items which come first; subordinate rank is indicated for such items as are assigned a later place; but on a map there is no beginning or end; the whole surface is presented simultaneously, and the student may first take up any part he pleases. If any one wishes to learn minute details as to the length or direction of certain small streams, the location and altitude of hills, and so on, he can best find them on a map; but if he wants a well-phrased characterisation of a district, he will be best helped by a verbal description, on a scale appropriate to the occasion. Hence the importance of giving conscious practice to the preparation of verbal descriptions of a given district or region on different scales; one might be ten lines long; another might fill a page; a third, a chapter; a fourth, a volume. A geographer who proposes to make himself proficient in his science ought to practise himself as thoroughly in writing descriptions on different verbal scales as in drawing maps on different graphic scales.

Maps differ in style as well as in scale. A wall map on a given scale is coarse-textured, so that certain leading features may be seen across a room. A map of the same region, and on the same scale, divided into sheets and bound in an atlas for library use, is crowded with minute details of fine texture. Verbal descriptions also may vary in style as well as in scale. For example: the first account of the

dissected coastal plain on the Adriatic border of Italy may be regarded as of medium scale and of technical style; the several following paragraphs, in which the same ideas are presented in more general language, is on larger scale, so far as space is concerned, but as it is of popular rather than of technical style, it really adds no new facts, nothing but ease of apprehension to the smaller scale description; hence it may be compared to a wall map, in being offered to ready understanding. On the other hand, if the increased space had been given to a continuation of the technical description for the purpose of bringing in many details, the larger scale of description might then be compared to a larger scale of a map for library use, in which many small features are indicated. Hence style as well as scale requires consideration; and in acquiring the art of geographical description, conscious experiment and practice should be given to various styles as well as to various scales.

From all this it must appear clearly enough that the preparation of an effective verbal description, after all necessary field studies have been made, will require the careful consideration of several different points. The style to be adopted should be first determined according to whether the description shall be technical, for trained geographers; or popular, for intelligent, mature, non-technical readers; or elementary, for young beginners. Second, consideration must be given to the scale or space permissible, according to the opportunity for publication and to the relation which the description bears to the rest of the volume in which it may be only a part. In view of the style and the scale as thus determined, the critical selection of certain items to be included and of others to be excluded may come next: and with this should go the careful determination of the order in which the included items shall be presented. It has already been shown that various items concerning location, dimension, attitude and direction of subordinate features had best be omitted from verbal descriptions, because they have their better place on a map; if included even in a large-scale verbal description of technical style, they will make it unreadable. It is chiefly the generalised treatment of dominant or of recurrent elements that deserve verbal statement, with subordinate place for the most significant exceptional features.

As to order of presentation, a whole essay might be written. I shall here emphasise only certain leading principles. The first is, to present the main idea in the first sentence; to give at once, at the very outset, a general block-statement for the district concerned. The reader will then most promptly apprehend its general nature, most easily follow the explanatory paragraphs as they are expanded, and most readily appreciate subordinate features, item by item, as they are introduced in orderly advance. The case is utterly different from that of a novel or a play, in which it is appropriate enough to conceal the plot till the end is approached: here the reader or listener enjoys being kept in the dark while the story is developed. But in a scientific essay, the reader ought, contrary to common practice, to be made aware of the end at the beginning, particularly if the explanatory method of description is employed: so that as the description advances, the leading

explanatory ideas as stated in the first paragraph may be constantly confronted with the evidence that bears upon them, and so that the smaller features may be immediately placed in their proper position with respect to the general scheme. Narrative descriptions, in which items are presented in the order of encounter in the field, may be appropriate as a means of recording the work of hasty reconnaissances, but when the narrative method is employed in the presentation of more careful studies, the most that can be said of it is that, as far as scientific geography is concerned, it is a very easily acquired and unambitious method.

It has already been pointed out that the location of natural features should not be indicated by means of their relation to small artificial features, such as little villages, which must be unknown to most readers; but, on the contrary, that small artificial features, such as little villages, ought to be located in relation to the previously described natural features, to which they stand in some reasonable relation. This principle should surely be carried out by those who believe that the location of artificial features exhibits some response to physiographic environment. Likewise, an individual hill or stream should not be first indicated by its name, which is the least natural thing about it, and which is unknown to the reader and therefore of no assistance to him in his reading. Such features should be introduced in general terms, by first describing the whole group of features to which they belong, and then singling out such members of the group for location and name as may be desired.

It is of prime importance to the writer to test his own description as he prepares it: to determine whether his manner of announcing the most general features is thoroughly effective; whether the order in which he introduces secondary and tertiary items is the most appropriate. Practice added to close scrutiny can alone develop proficiency. On the other hand, when a carefully prepared description reaches the reader, he must exercise a considerable degree of attention and skill, in order to apprehend the full significance of the writer's terse phrases: and he must use a skilful imagination in the process of visualising the forms, large and small, as they are introduced by the writer. Here again, nothing but practice can produce proficiency: and all this suggests that the training of a would-be geographer ought to include conscious, well-planned exercises in all these processes of observing, generalising, writing, reading and visualising, just as surely as it should include exercises in surveying and map-drawing.

The best geographical descriptions fall short of satisfying the reader if they are purely verbal: they ought to be supplemented by graphic devices wherever possible. A small scale map may be introduced to great advantage on an early page, in order to exhibit general locations; hence, well known as Italy may be, the places above mentioned in connection with my Italian excursion are probably identified more easily and more promptly than they would be otherwise, by means of the outline map, Fig. 1 (see p. 567), prepared in an hour, here reduced to small scale, on which our route may be followed, and on which the Ancona district and

the valley of the Lamone above Faenza may be quickly found. A larger-scale map may, if available, be appropriately provided to accompany more detailed descriptions; a good purpose is served in this respect by the elaborate sheets of the Italian topographical map, 1 : 100,000, already mentioned, which clearly exhibit the mature dissection and the even truncation of the coastal plain, south of Ancona, and the strand plain by which the former sea cliffs are now separated from the shore line. Photographs and sketches serve to illuminate the text; but in recent years photographs have been rather recklessly used, particularly when they are printed in a very blurred condition on rough paper. Sketches are in many cases more serviceable, even though less accurate, than photographs, because they show what the observer wishes them to show. As a subordinate matter, let me add in this connection certain details that are often overlooked, if one may judge by many illustrations in scientific journals. First, the size of the page on which a figure is to be printed ought to be learned before the figure is drawn. Decision should then be made as to whether the figure shall occupy the whole breadth of the page or only half the breadth; and to do this it is worth while to sketch the figure roughly on the scale that it will have in the text. When this is settled, the figure should be redrawn on double scale with really black ink in smooth firm lines, so that it may be effectively reduced in making a black and white "process" cut. If any lettering is included, let it be plain and unshaded. The number and title of the figure ought not to be drawn on it or below it; both can be set up in type, when the figure is printed in its proper place in the text, thus saving in time and gaining in appearance. These are trifles: but trifles ought to be properly attended to, and not neglected.

In addition to the various cartographic and pictorial aids thus far mentioned, let me call special attention to the device known as block diagrams, or bird's-eye views, such as Figs. 2 and 3, which may be designed so as to form useful supplements to descriptions that open with condensed block statements. Both tell the plot of the whole story at the beginning, and thus allow the reader to place all details where they belong, when they are met in later paragraphs. Just as block diagrams aid in giving graphic illustration to the members of series of deduced type forms, as has already been mentioned, so they aid in the understanding, the description of actual regions, because they serve so immediately to present the generalised type forms with which the observer compares the actual forms. When seen cornerwise, block diagrams have the advantage of presenting two structural sections, if desired, in immediate association with the surface forms that have been carved on the structural mass. When drawn in groups, they have the further advantage of compressing into a single view the several successive stages of development, which are verbally presented or implied in the statement of the text.

Diagrams of this kind are not and are not meant to be mere pictures of observed landscapes, for they must always be simplified by the judicious omission of much unessential detail, and greatly compressed by the omission of many repetitions of similar elements. They may indeed

be rather fanciful, in being designs rather than copies of nature, as is the case with Figs. 2 and 3, above. They should be simply drawn so as not to demand too much time in preparation, yet they may still be vivid and effective in aiding the reader to grasp the meaning of the writer.

No one may be more conscious of the defects of diagrams than the one who has drawn them. In the imaginary view of the dissected coastal plain south of Ancona, here given in Fig. 2, the hill shading is very rough; all the slopes are drawn convex, and hence fail to show the graceful concave lower sweep down to the valley floors. The terraces in the main valleys and the narrow belt of oldland included in the background are too definite and distinct. The absence of all indications of forests and fields, of villages and roads, gives an impression of barrenness and vacancy that does no justice to the pleasing reality. Moreover, the dissected hills and the broad valleys of two consequent streams extended from the oldland do not correspond to any particular hills and valleys of the district concerned; they merely show the observer's generalised idea of the kinds of hills and valleys that characterise the district. Nevertheless, the drawing has a value in immediately presenting the essential features of a late maturely dissected plain, in which the streams and valleys are prevailing consequent, with some insequent branches; in which the hill sides are all reduced to gently graded slopes; and in which the spurs in the fore-ground are all evenly truncated by the former sea cliff, in front of which the strand plain is now prograded.

Similarly, the invented sketch given in Fig. 3 shows only the kinds of features that were noted in the valley of the Lamone, and not the actual features themselves. The maturely dissected hills developed on the more resistant structures occupy the middle and left of the view; the incised meandering valley of the second cycle is maturely opened beneath the floor of the broader, late mature valley of the first cycle; the sharp-cut side gorge through the hills of harder structure in the left-centre contrasts with the wider side valley on the right, where the weaker clays of the dissected coastal plain replace the more resistant strata of the Apennine foothills; and in immediate association therewith is seen the broadened floor of the main stream after it passes from the more resistant into the less resistant structures. The diagram would surely be much more faithful, if it had been drawn from a hilltop on the near side of the valley instead of from the imagination of what such a hilltop view would be. Many of the lines would be smoother and steadier, if they had been drawn by a professional draughtsman; but diagrams prepared by some one else than the observer are hardly more satisfactory than lectures prepared by an expert typewriter instead of by the lecturer himself.

Block diagrams are more immediately understood than maps are; they are vastly superior to mere profiles, which of all graphic devices are of least value to the geographer: for he is concerned with surfaces, not with lines: yet if profiles are wanted, they are found along the side of block diagrams, in their proper position with respect to the adjoining surface. For the purpose here indicated—that of giving an immediate

introduction to the whole story—block diagrams are as much more serviceable than photographs, as photographs are more serviceable than block diagrams when it comes, later, to the presentation of details. One of the chief values of block diagrams remains to be mentioned; they can be drawn from any desired point of view, as in the case of Figs. 2 and 3, so as to show the features represented in the best possible relation to each other. Some ingenuity in the way of inventing and designing is here called for: and it is well expended if the final diagram is thereby drawn in the most effective manner.

An objection that is often raised against the use of block diagrams—that their preparation demands a knowledge of drawing—ought to have small weight among practical geographers, especially among the younger ones. To object to an effective kind of diagrams because their preparation demands a moderate skill in drawing, is like objecting to horseback riding during a geographical excursion in the West because it involves a little skill in the saddle; or to the use of original photographs as illustrations, because their preparation requires a little acquaintance with cameras and films; or to the consultation of European journals, because this calls for a moderate knowledge of foreign languages; or to map-making, because it depends on an elementary understanding of cartography; or to preparing a written report, because it involves a knowledge of composition. There must, of course, always be a great difference in the proficiency that different geographers will reach in these several associated arts; but any one who is in earnest in his work may soon acquire a profitable reading knowledge of a foreign language or two, or a sufficient comfort in horseback travel, or a simple proficiency in photography, or a reasonable expertness in writing reports on various scales and in various styles, and also a helpful handiness in drawing diagrams. The only serious point here to be settled by a practical geographer is: Are diagrams, foreign languages, photography, and riding, and so on, really helpful in the kind of work that he proposes to undertake? If they are, then he will as a matter of course set about acquiring some degree of skill in each and all of them.

Allow me briefly to consider some of the objections that have been urged against the method of structure, process and stage in the description of land forms. A German geographer has regarded that part of the method which involves the scheme of the cycle of erosion, as too rigid, and has likened its use in the description of natural landscapes to the cramping of nature in a strait-jacket. Such a criticism only indicates the complete failure of the critic to apprehend the method; for it is essentially elastic and adaptable; much more so, I believe, than any other method of description that has been formulated.

Some other critics have regarded the method as too geological, because it requires the consideration of underground structures and of past processes. This it certainly does require; nevertheless, it introduces underground structures only so far as they aid in the appreciation of visible surface forms; and it introduces past processes only in so far as they aid in the explanatory description of actual surface features. In this respect, it is interesting to note that, judging by my experience in

Germany a year ago (1908-09), the method of structure, process and stage is much less geological than the method of geographical description commonly employed by the younger geographers at the University of Berlin; for they habitually present past geological conditions and processes as such, and treat them as characteristic parts of geographical reports, even though the events thus brought in from the past bear in no direct or helpful way on the features of the present. Many interesting discussions were held on this point, always with the object of trying to emphasise the existing visible landscape as the object of a geographer's work, and hence with the wish to exclude every geological item, however interesting in itself, if it had no helpful bearing on the observable facts of to-day. For example, I questioned the value of the geological term, Triassic, in the account of a certain district in Hesse; my contention being that all a geographer's needs were satisfied when the composition, structure, thickness and attitude of the formation concerned were stated, without regard to its date: but German geographers seemed to be in favour of including the names of geological formations in geographical descriptions. The geologist of course wishes to know the date of origin, as well as the present structure and attitude of the formations that make up a district: but the geographer has little or no need of such historical information, although it is extremely important for him to know to what stage of erosion the district concerned has advanced in one or in several successive partial cycles. However, this is a subordinate matter.

An English geographer has expressed some doubt as to whether the method of structure, process and stage, which he recognises to be of value for the description of small districts, will prove serviceable for the description of large regions. My own opinion on this point is that its value for large regions can only be determined by experiment, which I should like very much to see tried. In any case, we can gain no comprehension of large regions save by gathering and by generalising observations of small visible landscapes. It is fair to expect that the better our understanding of detailed morphology, the better we can summarise general features. My own experience in describing the larger subdivisions of the United States and of Europe would encourage me to say that the explanatory method can be well used for the treatment of such areas: but I have made few systematic experiments with any other method of description.

Another geographer has expressed his fear that an explanatory method of description for land forms will prove dangerous in the hands of untrained students, and that young disciples may apply it in a way that will cause anxiety at first and horror afterwards. Horror is rather a strong word to use in this connection; but I can instance several examples that have caused me some anxiety, and others which have, I am sorry to admit, shocked me, to say the least. In these cases and in various others of a similar kind, criticism ought not to be directed against the explanatory method of description, but against its wrong use. It is proverbial that "a little learning is a dangerous thing". the proper guard against such danger is better found by decreasing the careless use of an explanatory method than by discouraging its careful development.

The kind of criticism that the method of structure, process and stage really needs is, as has already been intimated, criticism based on the experimental and comparative use of various methods, each method being first carefully thought out, and then all the methods being thoroughly and impartially applied to one and the same district. Experiment of this kind should of course be made by various observers of different trainings and preferences and in different localities. Precisely this sort of experimental criticism was attempted during the Italian excursion of 1908, but under conditions, as already pointed out, that predisposed the jurors to a verdict in favour of a particular method. It would be a good thing for geographical progress if a larger experiment of the same kind could be made. I trust that our association may some day actively engage in such an enterprise.

THE MEETING OF THE BRITISH ASSOCIATION.

THE Sheffield Meeting of the British Association opened on Wednesday, 31st August, with the delivery of the Rev. Prof. Bonney's address, which we published in our last issue. The headquarters of the Association were at the Cutlers' Hall, but the Sections met in a number of different buildings, none of which were however at a great distance from each other. The number of members and associates was not large, 1449 in all, but the meeting was nevertheless a very successful one, and the meetings of Section E, held in the hall of Firth College, were well attended. A special feature of the meeting was the generous hospitality offered.

The proceedings of Section E were opened on Thursday morning by Dr. Herbertson's address, which we published here last month.

The Presidential Address was followed by a paper by Dr. J. D. Falconer, M.A., F.R.G.S., on the Origin of the more characteristic Features of the Topography of Northern Nigeria. This paper was illustrated by lantern slides. Mr. Falconer pointed out that the Protectorate comprises an area of about 255,700 square miles, the greater part of which lies between Lake Chad and the confluence of the rivers Niger and Benue. The hydrographical centre of the Protectorate is the Bauchi plateau, which rises to a height of 4000 to 5000 feet above sea-level. The rivers belong to two great hydrographical systems, the Niger-Benue system and the Chad or desert system. The watersheds are lofty plains characterised by a matured topography, while the more prominent ranges of hills exert only a very secondary influence on the drainage system. The rivers in their upper and middle courses flow over open plains whose surface is diversified by numerous isolated granite domes, turtlebacks, and groups of rounded hills (inselberge). In their lower courses, on the other hand, they frequently flow in deep and trench-like valleys, bounded on either side by ranges of flat-topped hills. These plateau-like masses and tabular and conical hills have invariably been carved out of horizontal sedimentary

rocks, while the isolated domes and turtlebacks of the upper plains afford clear evidence of a crystalline floor.

The peculiar character of the river valleys is entirely due to the recent origin of the whole river system. It is believed that in late Tertiary times the surface of the Protectorate was for the most part reduced to low relief, and that the plains of Hausaland were continuous with the plains of Borgu and Ilorin across the Niger valley. The crystalline plains with their domes and inselberge, as well as the sedimentary plains with their flat-topped and conical hills, are to be regarded as a final product of the subaerial denudation of a land surface exposed to alternations of periods of erosion and periods of intense weathering of the rocks *in situ*. Late Pliocene or early Pleistocene crustal movements brought about the irregular elevation of this levelled surface into elongated arches and troughs along axes which run approximately NNW.—SSE. and WSW. —ENE. The summits of the arches form the present watersheds, while the floors of the troughs are occupied by the present trunk streams. The effect of the interference of the two sets of arches, of their gradual and unequal elevation from point to point, and of the geological structure of the country can be readily recognised in the principal river valleys. The intersection of the two central arches was marked by the differential elevation of the Bauchi plateau and the Nassarawa table-land and the lagging behind of the middle Benue valley. The valleys of the upper Benue and of the middle Gongola are more ancient than the Niger valley, and appear to be relics of an earlier hydrographical system. The presence of swampy and lacustrine conditions in Bornu dates from a period preceding the movement of elevation. Lake Chad, as we know it, owes its origin indirectly to its position in a trough between two axes of elevation, and more directly to the recent presence of arid conditions in the Sudan.

Dr. Falconer was followed by Dr. W. S. Bruce, who gave an account, illustrated by lantern slides, of his explorations in Prince Charles Foreland, Spitsbergen, during the summers of 1906, 1907, and 1909. We have noted here the chief points as regards these successive explorations, but the following summary of results is interesting :—

The island is about fifty-four miles long and from three to seven and a half miles broad, having an average width of five miles; the area is about 262 square miles. An almost continuous mountain chain occupies the northern two-thirds of the island. At the south end is a hilly portion, the "Ross Heights," separated from the northern chain by an extensive low-lying part now called the "Foreland Laichs." The northern mountain chain is now named the "Northern Grampians," and in its central part has hills rising to a height of over three thousand feet. The northernmost of these is Mount Monaco (3800 feet), and the southernmost is Mount Jessie (3300 feet). They are magnificent, precipitous, sharply peaked mountains with precipices and gullies to the west, while they are heavily glaciated to the east with a large and almost continuous ice-sheet, which is fed from glaciers arising in the first place from the very summits and highest ridges.

A considerable number of soundings were taken in Foul Sound demonstrating a bar towards the northern end over which vessels drawing over

twelve or fifteen feet have difficulty in finding a passage. In the south end of Foul Sound depths of considerably over a hundred fathoms were obtained, rapidly coming up to three or four fathoms near Ferrier Haven.

Geologically, the island is composed of hard graywackés and schists, probably of the Hekla Hook series; at the west end of Glen Mackenzie very coarse conglomerates forming the North and South Sutors occur, with sandstone slabs resembling Caithness flags further to the west along the shore. On the east coast, fringing the low land which surrounds almost the whole island for a mile or more inland, are to be found Tertiary beds containing plant remains. These occur to the south of Point Carmichael and at Ferrier Haven.

The flora is similar to that of the mainland of Spitsbergen.

The fauna is also similar to the mainland, but Dr. Bruce added a new record not only for the Foreland, but for European Arctic regions, in finding the adult and fledglings of the sanderling there. The capture of the sabine gull and the recording of great northern diver and razor-bill are also noteworthy. Much yet remains to be worked up regarding the micro-fauna.

Dr. Bruce also gave an account of his plans for a second Scottish National Expedition. These plans have been already placed before the members of our Society.

In the afternoon, Captain J. K. Davis described the voyage of the *Nimrod* from Sydney to Monte Video, from 8th May to 7th July 1909, and the search for the Royal Company, Emerald, Nimrod and Dougherty Islands, the existence of most of which as a result of this voyage has been rendered very doubtful. Macquarie Island was visited and a considerable number of scientific specimens obtained. The island proved to have an inhabitant in the shape of an Irishman who, at his own wish, had been left behind by a seal-oil party, and was living on the hearts and tongues of sea-elephants. During the voyage series of valuable meteorological observations were made.

On Friday morning the Geological and Geographical Sections met together to hear some papers, chiefly of local interest. Mr. Cosmo Johns read the first paper, which was on the geology of the district, and naturally laid special stress on the coal seams which have made the development of Sheffield possible.

Professor A. M'William, A.R.S.M., M.Met., of the University of Sheffield, followed with a paper which was more definitely geographical in that it dealt with the relation between the metallurgical industries of Sheffield and the rocks of the district. We give below the main points of the paper.

Sheffield is situated on the outcrop of the coal measures, which consist of alternating sandstones and shales, with beds of coal, clay ironstone, and fireclay. The district was in ancient times thickly wooded, affording supplies of the then principal metallurgical fuel, charcoal. The raw fuel of to-day is coal, and the enormous influence of this source of practically all our power, high temperatures, and artificial light is so obvious that it need only be mentioned. The most striking development since the last visit of the Association is the establishment of a line of

collieries down the outcrop of the Permian rocks to the east, where the well-known beds of coal were found at reasonable depths. Recent developments even within the last two or three years have made the district one of the richest in the kingdom with regard to coal supply. The clay ironstone, ferrous carbonate with clay, yields an excellent pig iron, containing about 0·6 per cent. phosphorus, and suitable for making into castings and for the manufacture of the best qualities of wrought iron for use as such. This ore is the source of the famous Yorkshire iron, still made near Leeds, though in diminishing quantities. The great bulk of the ironstone now used is the cheaper variety from Northampton, Leicester, and Lincoln, and consists of brown iron ore, hydrated ferric oxide, yielding pig irons containing about $1\frac{1}{4}$ per cent. of phosphorus. These are suitable for manufacturing cast iron castings and ordinary wrought iron and for making into basic steel, the refractory dolomite necessary for lining the vessel or making the hearth in which the steel is made, being procured from the magnesian limestone to the east. These pig irons are not suitable for making into the highest qualities of Sheffield's special steels, so hematite pig irons, from the hematite ores of Lancashire, Cumberland, and Spain, are imported for making into acid Bessemer or acid open hearth steel, that is, steel made in an acid- or silica-lined vessel or hearth, which can thus be finished in contact with an acid slag. The best qualities of Swedish wrought irons are also imported for making into cutlery, edge tools, general cutting tools for engineers, etc. As refractory materials for these processes, and even for the roofs of the basic furnaces, much acid material of great purity is required. Some of the coal measure sandstones consist of particles of quartz that have been cemented by silica, so that the whole rock often consists of 98 per cent. SiO_2. This rock, called ganister, is mined round Oughtibridge and made into refractory silica bricks for withstanding the highest furnace temperatures. A similar firestone is used for building the walls between the crucible holes and for other purposes, and ground ganister, mixed with a little fireclay and water, is rammed round wooden moulds to form the crucible melting holes and also the linings of Bessemer converters. Fireclay is also abundant, providing the firebricks used for the less highly tried portions of the furnaces. Some of the Carboniferous sandstones yield splendid grindstones, and building stones are abundant and at high levels, whilst there are deposits that are of the composition necessary for making ordinary bricks without any additions. The inexhaustible Derbyshire limestone is available as a flux, and the fact that lead mining in the mountain limestone was once a great industry has an important bearing on the manufacture of basic steel, for the great heaps of gangue left by the miners are being worked over for fluor spar, which is used to help in desulphurising the metal. Barytes is won at the same time, and though mainly used as the most permanent white basis of photographic papers and for mixing with white lead, some of it may be converted into $BaCl_2$, which is brought to high temperatures by electrical means for heating high-speed steels for hardening purposes. The millstone grit, once so famous for its use as millstones for grinding corn and for erecting buildings to last for aye, is now superseded, for the former by iron rolls, and as it is too hard to

work for present-day building requirements, it is mainly left to look grim and grand in the scenery, though recently it has been much used in building the new great dams and helping to add the only feature our beautiful district lacked, extensive sheets of water. Sheffield is therefore situated in the midst of an abundance of flux for dealing with impurities, of fuel for power and for attaining the high temperatures required in the manufacture of iron and steel, and of the best of refractory materials for withstanding these high temperatures; and when materials at hand do not satisfy the severe requirements of the special trades others are freely imported, as in the case of hematite pig irons and Swedish and other wrought irons for making into the highest qualities of special steels.

Mr. T. Sheppard gave an account, illustrated by lantern slides of old maps and charts, of the changes which have taken place near the mouth of the Humber, from the earliest times of which records have been preserved till the present day.

Dr. Tempest Anderson also read a paper on Matavenu, the new volcano in Savau in German Samoa, which was illustrated by some very fine lantern slides.

During this joint meeting it was announced that the Committee appointed by the Council of the Association at Winnipeg to consider the relationship of the Sections had suggested that Sections E (Geography) and C (Geology) should unite, but it was unanimously resolved that they should remain as they are. At a meeting of the General Committee held the same day a similar resolution was likewise carried.

In the afternoon, Dr. Hamilton Rice gave an illustrated account of his journey through South America from Bogota to Manaos in search of the sources of the Uaupés river. Starting from Bogota the traveller crossed the Andes to Villavicencio, and then traversed the llanos to San Martin, the cattle centre of south-east Colombia. He then reached the "terra caliente" and the densely forested region in which the sources of the Uaupés occur. The paper described the geological character of the country through which the river flows, and the customs and habits of the Indian tribes living on its banks. These live under primitive communal conditions, existing chiefly by hunting and fishing, but practising agriculture to a small extent. They are monogamous except for the chiefs. The rubber industry is practised in this district.

On Monday, Mr. J. Howard Reed, F.R.G.S., one of the Hon. Secretaries of the Manchester Geographical Society, spoke on Cotton growing within the British Empire, and said that the cotton industry of Lancashire, which ranks next to agriculture in importance, employs close upon 500,000 workers, and gives sustenance to several millions of people, depends entirely upon an ample supply of raw cotton fibre. A shortage in the supply of raw cotton during recent years has caused not a little trouble and distress, and threatens more serious disturbance in the future. The shortage of cotton has been brought about by the greatly increased demands for raw fibre by the mills of Europe, and more especially by the vast development in the manufacture of cotton goods in the United States. Though the quantity of raw cotton used in Lancashire to-day is only a trifle more than was the case twenty

years ago, during the same period the weight of fibre used on the Continent has very nearly doubled, and the total is now more than twice that of the British figure. The demand of the American mills has increased at an even greater rate than has that of Europe, and is now nearly double the British demand, and nearly equal to that of the whole of the Continental countries.

Year by year we are gradually approaching a very serious crisis, as the shortage of cotton is regular and progressive, and unless supplies of raw fibre are obtained from other fields than those of America the Lancashire industry will not only gradually languish and decay, but will completely perish. For this reason it has become all-important that the industry of cotton growing in British colonies should be fostered and developed, and if the effort is not abundantly successful within a few years the great staple trade of Lancashire is doomed. This is a sweeping statement, but it is none the less true, although the people most interested even now do not seem fully to realise the position. For several years the British Cotton Growing Association have energetically devoted themselves to the solution of the problem, with some measure of success, although they have been tardily and inadequately supported with the financial aid which the great work needs. The countries of Egypt and India up to now have been the only substantial sources of supply which have supplemented the production of the American cotton fields. Some measure of increase may be expected from these districts, but such expansion will be wholly inadequate to meet the increasing demands of the world. It is well known that, generally speaking, all countries within forty degrees north and south of the Equator are climatically capable of growing cotton, provided the soil is of average fertility and the rainfall sufficient. It will be at once seen that such a cotton-growing zone embraces the whole of the British colonies except Canada, Tasmania, and a portion of New Zealand. Consequently there should be no physical or geographical difficulty in obtaining ample supplies of cotton within the British Empire, provided the necessary stimulus, financial and otherwise, is applied. The island colonies of Cyprus, Malta, Mauritius, Seychelles, and Fiji, and portions of Australia, British Borneo, and the East Indian colonies each and all produce native cotton, and such production can doubtless be considerably increased and rendered available for export. In the West Indies the efforts of the British Cotton Growing Association have already succeeded in re-establishing the industry of cotton-growing, with much promise of success. The African colonies, more especially Uganda, Nyasaland, and Lagos, have conclusively shown that the "Dark Continent" is destined to provide a very large share of the cotton fibre which is so essential for the commercial prosperity of the mother country, and for the salvation of the great Lancashire industry. So far, for the seven years during which the cotton-growing effort has been pushed and stimulated, considerable success has been achieved, but what has been done only makes it clear that the efforts need to be continued with increasing energy. The increased production of cotton, due to the efforts of the British Cotton Growing Association, has been progressive from year to year, but the

needs are so enormous and the work so colossal that the increased supplies obtained during seven years only reach about one-thirtieth of Lancashire's average yearly demand.

In the discussion which followed, the opinion was expressed that Mr. Reed's views on the future of the British cotton industry were somewhat too pessimistic.

Major R. G. T. Bright, C.M.G., then read a paper on his journeys in the Region of Lakes Albert and Edward and the Mountains of Ruwenzori. The paper described the country on the western frontier of the Uganda Protectorate. A large number of beautiful photograph slides were shown, including views of Lakes Edward, George, and Albert. He was followed by Lieutenant P. T. Etherton, F.R.G.S., who described an interesting journey through the heart of Asia from India to Siberia.

This expedition, from India through Gilgit, Hunza, across the Pamirs, and thence through Chinese Turkistan, Mongolia, and Siberia to the Trans-Siberian Railway, was undertaken for the purpose of big-game shooting, and the study of the larger fauna of Central Asia and Mongolia. The distance covered totalled nearly four thousand miles, and lay over routes which to a great extent had never previously been traversed. The only persons who completed the whole of the journey were Lieutenant Etherton and his native orderly, a Garhwali from the Himalayas, the caravan men and followers being changed from time to time. The average strength of the caravan was ten men, but this was varied to meet circumstances. Lieutenant Etherton left Lansdowne in the Himalayas in March 1909, and travelled *viâ* Kashmir, the Gilgit valley, and Hunza to the Pamirs, meeting with great difficulties on the way, owing to the road being blocked by snow and huge avalanches. On the Pamirs the expedition remained one month, the camp being at an elevation of from 14,000 to 15,000 feet above sea-level. From the Pamirs Lieutenant Etherton proceeded by the Ili Su Pass (16,750 feet) to the little known Yarkand river, and thence crossed into the Kulan Urgu valley by a pass (17,400 feet) which had never been previously crossed by a white man. Here the expedition met with numerous difficulties owing to the mountainous nature of the country, one of the yaks being lost down a precipitous slope, falling over 1500 feet. After that the greatest difficulty was experienced in crossing fords in the Kulan Urgu valley. Lieutenant Etherton arrived there in June, when the water is at its highest from the melting snow. The fords are extremely dangerous, yet twenty-six of them were crossed in one day. From the Kulan Urgu valley the expedition crossed by two high passes into the valley of the Asgar Sai, and down this to Yarkand, where it arrived in the middle of June after many adventures. Thence the journey was continued onward through Chinese Turkistan for several hundreds of miles to the Tian Shan mountains, the central portion of the mountain system of Asia. Here three months were passed, during which Lieutenant Etherton visited and traversed the Great Yulduz valley, about which comparatively little is known since the Russian explorer Prejevalsky travelled through a part of it in 1873. In the Tian Shan the expedition was in the midst of the ibex and the Asiatic wapiti country, and some

fine specimens of the latter were bagged. Thence the expedition crossed into the Ili valley and on to Kulja, a town of much political importance. From here Lieutenant Etherton struck through the Sairam Nor and Ebi Nor country and the mountains beyond to Chuguchak, a town in Western Mongolia. In this stage of the march difficulties were numberless, for the region is practically unknown, the people lawless, while the climate at this season (November and December) is noted for its severity. It was in the country bordering on that vast inland sea, the Ebi Nor, that the traveller first saw wild horses. He passed around the Kesil Bach Nor, in Mongolia, another inland sea. The expedition encountered strange nomad tribes of Kalmuks, Kazaks, Kirghiz, and Mongols, concerning whom many interesting notes were gathered. The expedition reached the foot of the Great Altai mountains, on the northern side of the Black Irtish valley, at the end of December, with the thermometer at – 35 degrees, and the whole country ice-bound. The Altai form the principal range in this part of Asia: their component rocks are largely argillaceous schists, with granite in the higher parts, and alluvium and diluvium lower down. In this extensive chain is found a great number of the larger mammals, including *Ovis Ammon*, the true argali of Central Asia, as well as the Altai wapiti, red bear of a species peculiar to the Altai, roe deer, and other animals. While in the Altai the expedition was caught in a blizzard, and practically the entire caravan was frostbitten, including Lieutenant Etherton and his orderly. Thence ensued twelve fearful days of trekking to a small military post on the Siberian-Mongolian frontier, where medical assistance was available. The expedition arrived here on 9th January 1910, and a month later continued the journey for eight hundred miles through Siberia to the Trans-Siberian Railway, mostly by sledge. Lieutenant Etherton's trophies included ibex, the rare Asiatic wapiti stag, roe deer, *Ovis Karelini*, etc. He reached England in March 1910.

On Tuesday, the last day on which meetings of Section E were held, a number of short papers were read.

One of the many latter-day devices for making geography interesting to the beginner was to have been introduced and explained by Mr. W. Wilson. It was a new globe map of the world and a new equal-scale atlas. Most people know that the use of the globe as an aid in teaching geography has largely ceased owing to the high cost and cumbrous nature of the globes that are made. Mr. Wilson has a plan for overcoming the difficulty. He first mounts a special globe map on thin cardboard and cuts out the gores. The cardboard sections are then bent and suitably fastened to form a globe. The globe can be unfastened in a few seconds, and studied as a flat map. It may be readily packed, and it takes up no more space than an ordinary school book.

At the opening of the meeting the President said that unfortunately Mr. Wilson was not able to be present. He had looked at the globe. It was a very ingenious one, and helped the teacher to explain the ordinary Mercator projection very much better than many other devices he had examined. The globe map was on view for those who desired to see it during the meeting.

Two papers dealing with regional surveys were then read. One was by Mr. O. G. S. Crawford, and dealt with the Andover Region in Hampshire, and the geographical aspect of its present conditions. The subject was discussed under the following headings:—

Introduction.—Reason for choice of title; the two points of view; evolution in time and distribution in space; a proposal to reconcile them.

1. *Physical Features.*—(*a*) Land forms; (*b*) drainage system; both the result of geological structure.

2. *Natural Vegetation.*—Gradual replacement by artificial vegetation; survivals of the old order; to grasp the significance of any epoch, past or present, the precise limits of forest, cultivation, and waste must be known and visualised.

3. *Industries.*—Outcome of the geology and vegetation: (*a*) agriculture, or artificial vegetation; (*b*) live stock; (*c*) building materials: (*d*) road materials.

4. *Settlements.*—Their distribution determined by need of sustenance for man and beast.

5. *Communications.*—Character directly influenced by physical features and vegetation.

Conclusion.—The reaction of man upon his natural surroundings.

The second description of a regional survey was a paper read by Mr. J. Cossar, who dealt with Midlothian, the area being that shown on Sheet 32 of the one-inch Ordnance Survey Map of Scotland, which includes Edinburgh.

Mr. Cossar's paper was crowded with detail, and it is possible only to give a short résumé. He noted that the area is very rich in minerals of high economic worth. Visitors to Edinburgh remark the solid and rather substantial appearance of most buildings. Even the cheapest workmen's houses are built of what elsewhere might be regarded as very superior stone. The reason for this is simply that the region abounds in stone of the very highest quality: not only so, but the building trade is also favoured with an excellent supply of lime, found both to the east and to the west of the region. Of still greater value are the oil-shale supplies found in the western part of the region.

To the east the most important economic mineral is, of course, the coal supply of the Midlothian coal basin, which was worked as early as the thirteenth century by the monks of Newbattle, who built a small harbour. To-day the presence of this coalfield is rapidly transforming the character of the region, and mining villages are now being established. Dalkeith, formerly a simple market town, is now an important centre. The presence of coal also explains and determines the exports from Leith, in whose trade it forms a most important out-going item, with pit timber as an import.

These papers were followed by two on cave exploration. Mr. Harold Brodrick, M.A., described the Underground Waters of the Castleton District of Derbyshire, and said that to the west of Castleton and 600 feet above it is a long valley, in the base of which runs one of the transverse Pennine faults. This fault brings down the Carboniferous limestone, so

that the streams to the north run over the Yoredale rocks to sink into the limestone. There are several streams, but only one ends in a cave of any size, the Giant's Hole. This has been explored for a distance of 410 feet, where the water sinks in a deep pool. These waters run through an unknown course near which is Elden Hole, a vertical shaft 200 feet deep, with a further drop of about 50 feet below. This is now dry. The water is next met with at the upper end of the Speedwell Cave, where it wells up from a deep pool. The stream flows through the Speedwell Cave for 800 feet into the disused workings of the Speedwell Mine, being joined on its way by another passage 500 feet long, at the upper end of which is a fine chamber. The combined streams flow through the old workings for 1000 feet, and finally fall into the so-called "bottomless pit," which is actually 90 feet deep, the bottom being filled with water 22 feet deep. The upper extension of the pit has not been explored within historic times, although the miners evidently climbed it. From the Bottomless Pit to the entrance of the Speedwell Mine there is a straight flooded working 750 yards long, through which visitors are taken in boats. The next point at which the stream is met with is at the upper end of the Peak Cave. It flows in here at two points, which passages are found to join at about 100 yards from the portion of the cave ordinarily visited. The total length of the Peak Cave ordinarily visited is 1528 feet.

Dr. C. A. Hill, of Liverpool, then gave an account of further exploration of the Mitchelstown Caves in Ireland, carried out by himself and Mr. Brodrick. An account of the two caves, as far as they were then known, was read by the author at the Dublin meeting of the Association, in 1908. Since that date two visits have been paid.

The caves are known respectively as the Old and New. In the Old Cave the Earl Desmond took refuge during a time of rebellion in 1601. The walls of the main passages are covered with inscriptions of names and dates ranging from 1602 to about 1830. The entrance to the New Cave was accidentally discovered in 1833. Dr. Hill gave a detailed description of the interior of the New Cave, and showed several beautiful lantern slide photographs of stalactites and stalagmites.

The President, in a few concluding remarks, said that the exploration of underground passages was of very great service. It was a very important question how far a great many of the surface forms in chalk and limestone were due to underground erosion, and the slipping down of rocks which took place, or might take place, owing to the eating out of passages by water below. They hoped that by the extension of such work as Dr. Hill and Mr. Brodrick were doing it might be possible to throw some light upon the influence of underground passages on surface subsidence.

Among papers in the other sections having a geographical bearing we may specially note one read before the Geological Section by the President, Professor A. P. Coleman, on the Canadian Shield. From the report of this paper we quote the passages most interesting to the geographer:—

In its physiography the Canadian shield shows the features that might be expected from one of the oldest and most stable land areas of the world. It was reduced in very early times to a peneplain, but later was elevated, permitting the rivers to begin a process of dissection. This process had a recent interruption by the Pleistocene Ice Age, which blocked many of the valleys with moraines and gave rise to the most extensive tangle of lakes in the world. Physiographically, as well as geologically, the region shows a dramatic mingling of extreme youth with extreme old age. The peneplain has been unequally elevated, parts standing 3000 or 4000 feet above the sea, and other parts sinking beneath its surface. Only at two marginal points can the Archæan surface be said to rise as mountains—in the Adirondacks, projecting south-east into the State of New York; and in the Nachvak peninsula, just east of Ungava Bay. To the south-west and south the shield sinks, almost imperceptibly in many places, beneath the older Palæozoic rocks, and the same is true around the central depression of Hudson Bay. Toward the south-east the shield breaks off suddenly along the great fault of the Lower St. Lawrence, and apparently the precipitous north-east shore of Labrador indicates faulting on even a larger scale. In detail the region is full of variety of hill and valley, waterfall, river, and lake; but, on the whole, it is monotonous to the ordinary traveller from the constant repetition of similar forms, since there are no real mountain ranges and few outstanding "monadnock" hills to break the sky-line. The geologist finds, however, that this impression of general flatness is deceptive. In reality the rock structures are usually more nearly vertical than horizontal, as in most Archæan regions. The schistoze rocks, which form so much of the surface, commonly show dips of more than sixty degrees, so that it is clearly a mountain region planed down to its foundations. The arrangement of valleys, ridges, and hills generally follows more or less closely these ancient rock forms.

Until recently most of the geological work done in this northern territory has been track surveys following Indian canoe routes. Here and there moraines or old lake deposits hide the rocks for a space, but usually the geology is admirably displayed as the canoe threads the intricate waterways of sprawling lakes spilling over from one irregular basin into another. On entering a new district there seems a hopeless confusion of pinkish gneiss and grey-green schist, but presently orderly forms take shape upon the map as the numberless bays and islands are explored, and the ground plan of vanished mountain ranges begins to show itself. The typical arrangement is that of rounded or oval batholiths of gneiss, or of granite merging at the edges into gneiss, with schists dipping steeply away from them on all sides. Where the batholiths approach one another the green schists occupy narrow troughs between. As shown by Lawson, they are evidently the bottoms of synclines nipped in by the rising areas of granite and gneiss. Round these eruptive masses the schists have a strike parallel to the edge of the gneiss, so that they do not form ordinary synclines, but widen and narrow and swing in curves to adjust themselves to the varying relations of the batholiths. The meshes of green schist are often not

complete, the curving ends feathering out to a point. In such places erosion has eaten the surface down below the bottom of the syncline. On the large scale one can recognise a general trend in the direction of the longest axes of the batholiths, and the average strike of the schist in the various regions lies between fifty degrees and eighty degrees east of north, conforming to the same direction. This general east-north-east trend of the basement structures doubtless reveals the axial relations of the Archæan mountain ranges. The mountains erected on these bubble-like foundations of gneiss, set in meshes of schist in many places, do not seem to have formed continuous ranges such as those of the Rockies, but rather groups of domes of various sizes, some of them comparatively low, others lofty, though broad.

Another paper read in the same section was of interest in its bearing upon the problems treated in Professor Bonney's presidential address. This was a paper by Mr. G. W. Lamplugh on the glaciers of Spitsbergen, in which he said that certain phenomena which he had examined during a recent tour were of such great interest to Yorkshire geologists that he hastened to put them before the British Association, even if in a rough manner. Under the conduct of the Swedish experts who were investigating this area, he visited the glaciers of the west coast of Spitsbergen, and found boulder clays exactly like those of England, the cliffs of clay being indistinguishable from those of the Yorkshire coast. He went in detail over the features of this ground, where, within ten or twelve years, a glacier had advanced four miles over the sea bottom, withdrawn again, and left behind on the islands a boulder clay 90 or 100 feet thick, full of shells carried up from the sea. In the face of this evidence, he asked, was it of any use to discuss any longer whether glaciers could push shells and boulder clay up a slope, and whether the English boulder clay was the product of glacial conditions?

In regard to future arrangements it is of interest to notice that the Association has accepted an invitation to hold the meeting for 1914 in the capital cities of Australia. It is suggested that the Association should spend a few days each in Adelaide, Melbourne, Sydney, and Brisbane, and it is announced that the Federal Government has voted £10,000 towards the expenses of the sea journey, and there is to be free transport for the members of the Association over the railways of the country. The visit will involve an absence of at least three months from this country.

The meeting in 1911 is to be held at Portsmouth, from 30th August to 6th September, under the presidency of Sir William Ramsay. The meeting in 1912 is to be held in Dublin.

The following grants of money were allocated to Section E at the Sheffield meeting:—£30 towards the expenses of publication of Dr. W. S. Bruce's Map of Prince Charles Foreland, to Mr. G. G. Chisholm as Chairman of Committee; £20 to Professor A. J. Herbertson towards the publication of Equal Area Maps.

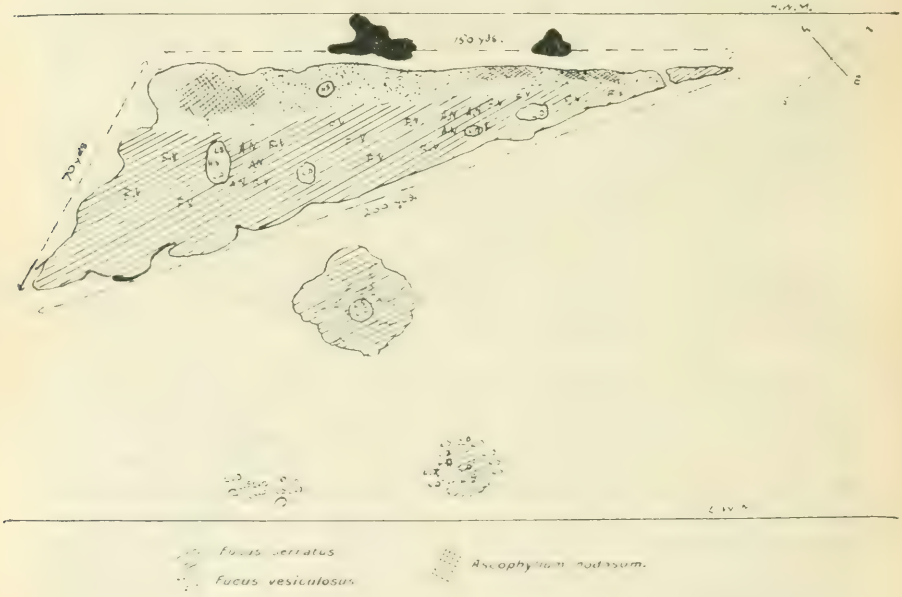
A METHOD OF MAPPING THE DISTRIBUTION OF MARINE ALGÆ.

(With Sketch Map.)

By N. Miller Johnson, B.Sc.

Up to the present time, the study of marine algæ has been mainly confined to two branches, namely, structural work including detailed accounts of life histories, and systematic work, having as its particular aim a comprehensive classification. On broad lines, distribution has also received attention, but when one desires information on the detailed geographical distribution of the marine algæ occurring round our coasts, one finds that practically no collection of data is available.

The generally known facts concerning the zonal distribution of algæ are not sufficient to account for others, frequently to be observed when



Sketch-map of a rock-mass near Dysart. The rocks consist of sandstone bedded upon soft shale, and the dip is towards the sea.

L.D. *Laminaria digitata*, L.S. *L. saccharina*, H.S. *Halidrys siliquosa*, F.V. *Fucus vesiculosus*, A.N. *Ascophyllum nodosum*.

visiting seaweed-covered rocks. These latter facts are as a rule known only to the local worker in a particular district. For instance, in the immediate vicinity of Dysart on the Fifeshire coast, *Pelvetia canaliculata* is entirely absent, while nearer Kinghorn and also on the rocks under Wemyss Castle, it is extremely plentiful. *Fucus vesiculosus* without bladders is very conspicuous at Dysart: near Pettycur it is less

numerous but with well marked bladders, while at Wemyss plants both with and without bladders occur fairly often. Interesting enough as these facts are from a distribution standpoint, their explanation would be still more important.

To clear the way for this explanation, the mapping out of selected areas would be a desirable preliminary step. In carrying out this process the following suggestions may prove helpful to local workers.

Plan diagrams, illustrating the distribution of conspicuous forms, might be made of the portion of coast decided upon. In order to make such a diagram the writer proceeded as follows. Repeated observations at low tide were made on the chosen area, a large triangular rock mass, immediately off Dysart, and in a rough sketch map the areas occupied by the most numerous plants were indicated. The positions of the less plentiful forms, and of those scattered among areas other than their own, were then added. Throughout all observations, distances and directions were noted.

In the accompanying diagram it will be observed that only Phæophyceæ or brown algæ received attention, but it would be entirely feasible to include both green and red forms. High and low water marks are shown by lines, and are labelled H.W.M. and L.W.M. respectively. Rocks rising above high water mark and upon which nothing grows, are shown all black, and the areas occupied by the most numerous algæ are marked as follows :—Crosshatching, *Ascophyllum nodosum*, dots, *Fucus vesiculosus*, and diagonal lines, *Fucus serratus*. Those plants which occur only in small numbers, or are present in areas other than their own, are shown by letters designating both their generic and specific names, thus :—L.D. *Laminaria digitata*, L.S. *L. saccharina*, H.S. *Halidrys siliquosa*, F.V. *Fucus vesiculosus*, and A.N. *Ascophyllum nodosum*.

Where such diagrams are made, the geological conditions should be noted, such as the kind of rock, and the tilt of the strata if any, as both these factors may have a direct bearing upon the distribution. If the above were carried out, not only in an isolated case as in the present instance, but for definite portions of our coasts, I feel sure that our knowledge of both the distribution of our conspicuous littoral algæ, and the reasons for such distribution, would be most considerably augmented.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

At a Meeting of Council held on Friday, 18th October, the following ladies and gentlemen were elected Ordinary Members of the Society :—

Mrs. W. Graham.
Miss Ella K. Lean.
Mrs. Craig Robertson.
George Graham Brown.
Lieut.-Colonel J. M. Fleming.
Geoffrey Fyson.
H. J. Findlater, W.S.
A. Bethune Duncan, J.P.
Mrs. J. Lusk.
Miss Craig Robertson.
James J. Barclay.
George Nathaniel Knox.
Hugh Baird.
John Adam, Jr.
Prof. J. W. Gregory, F.R.S.
E. A. Baxter.

The following were elected Teacher Associate Members :—

Miss Jeanie Hansell. Miss Helen M. Macfie.

T. D. Maxwell, B.A. (Oxon), Police Magistrate, Calabar, was appointed Corresponding Member of the Society for the Eastern part of Southern Nigeria.

The Society's Awards.

It was resolved to award the Society's Gold Medal to Professor James Geikie, D.C.L., LL.D., F.R.S., for his distinguished services to geographical science.

The Livingstone Gold Medal was awarded to Sir John Murray, K.C.B., D.C.L., LL.D., in recognition of his extensive oceanographical work, and more particularly in commemoration of the completion of his great national work "The Bathymetrical Survey of Scottish Fresh-water Lochs."

Diploma of Fellowship.

The Ordinary Diploma of Fellowship was conferred on Arthur Westlake Andrews, B.A., F.Hist.S., and J. Hamilton Birrell, M.A., members of the Society, subject to their compliance with the prescribed conditions.

Lectures in November.

The Inaugural Address will be delivered by Sir John Murray, K.C.B., D.Sc., LL.D., in Edinburgh on the 11th instant. The subject of his address will be "The Deep Sea." The Right Hon. The Earl of Stair will preside.

Sir Andrew H. L. Fraser, LL.D., K.C.S.I., will deliver the opening lecture at Glasgow, Dundee, and Aberdeen, on the 8th, 24th, and 25th respectively. He will make "Official Life in India" the subject of his lecture.

The Rev. James Webster will address the Glasgow Centre on the 23rd instant on "Manchuria Past and Present."

Annual Business Meeting.

The Annual Business Meeting will be held in the Society's Rooms, Synod Hall, Castle Terrace, Edinburgh, on Thursday, 10th November 1910, at 3.30 p.m.

Volunteer Lecturers.

From time to time applications are made to the Society for lecturers who might be willing to address, without fee, local Societies on Geographical subjects. The Secretary would be much obliged if any

members of the Society willing to give such lectures on any part of the world with which they are intimately acquainted, would kindly send to him their names and addresses, with an intimation of the subject on which they could offer lectures.

GEOGRAPHICAL NOTES.

EUROPE.

The Pastoral Industry in Spain.—In a recent issue of the *Annales de Géographie* there appears a curious and instructive article by Mr. A. Fribourg on "Transhumance" in Spain. The word is one for which there seems to be no English equivalent, because the phenomenon does not occur in the British Islands, or at least only in very much modified form. It is defined by the author as follows:—"The alternative and periodic displacement of flocks between two fixed regions, differing in climate." In the present instance the flocks concerned are of sheep only, and the movement consists in the journey towards the mountain pastures in summer, as soon as the plains become scorched, and downwards to the plains again, as winter approaches in the mountains. Formerly these migrations used to take place on a vast scale, the flocks including 10,000 sheep, and being accompanied by the shepherds, carrying long wands, and the typical shepherd's weapon, the sling. Twice a year they swept up and down the peninsula, journeying by special roads, like the Scottish drove roads, and raising, with the accompanying mules, dogs, and impedimenta, such a cloud of dust, that Don Quixote was perhaps justified in mistaking such a band for a hostile army.

The prime causation, as already indicated, of these movements was climatic, the climate in Spain being such that pasturage is to be found somewhere at all seasons of the year. But social conditions tended to favour the development of the movements. The wars of the Reconquest so devastated the land that agriculture was for long precarious. Again, as vast domains were taken from the enemy they were bestowed upon a few persons, and these great estates favoured the pastoral as contrasted with the agricultural industries. Once, however, the conquest was complete, the ancient and inevitable conflict between shepherd and husbandman broke out. During their long migrations the flocks naturally fed "on the country," as doubtless the shepherds did also. Thus the peasants had to stand by and see their fields trampled and destroyed, the grass of their meadows consumed, their gardens and vineyards ruined. In the long warfare the shepherds enjoyed the great advantage of royal patronage, and the formation of the Mesta, an association of those who possessed flocks, had both royal and aristocratic support, and obtained privileges which for three hundred years made it the persistent enemy of agriculture. The privileges were especially great in Castile, and they were an important factor in promoting the emigration of the peasants to the Americas, for they rendered the intensive cultivation of the land virtually impossible. In 1837 the Mesta was abolished, and since then

the number of migrating sheep has undergone a steady diminution. The plough has gradually invaded the drove roads, which in many regions have disappeared utterly. Within the last twenty years a new and curious change has occurred. Apart from the general diminution of "transhumance," due to the gradual increase of agriculture, there remains in certain regions, especially the north-east, the necessity for periodic movements in order to utilise the mountain pastures. But these movements no longer take place by road but by rail. The granting by certain railway lines of a special tariff has rendered this possible, and has put the final touch to the slow disappearance of the old drove roads, which, like those which once crossed the Southern Uplands of Scotland and the Cheviots, are disappearing alike from maps and from the memory of man.

Mr. Fribourg adds an interesting corollary to his paper. In this as in so many respects Spain forms a transition between Africa and Europe. In Algiers the conditions which existed in the Spain of the middle ages persist, and there also we find the old contest between shepherd and husbandman in the acute stage. In the parts of Italy and Southern France where "transhumance" once existed it is almost dead; the land is mostly too valuable for sheep, it is everywhere too valuable to permit of the persistence of the old pastoral routes, with their accompaniment of drinking-places and places set apart for the pasturage and folding of the migrant flocks. Between the two extremes Spain still occupies a transitional place.

Asia.

Mr. Carruthers' Expedition to North-West Mongolia.—Mr. Douglas Carruthers, with Mr. J. H. Miller and Mr. M. P. Price, is at present engaged in scientific exploration in the extreme upper basin of the Yenesei and in other parts of Mongolia, and has communicated to the R. G. S. some of the results of his investigations (see *Geographical Journal* for October). At the time of writing (July 25), the expedition was at Cha-kul on the Upper Yenesei, having left Minusinsk in May and traversed the Sainsk and Bei-kem districts of that region, drifting in rafts for 300 miles after reaching the Bei-kem river. As a result of the journey it had been ascertained that the supposed main range of the Saiansk mountains (shown on the maps) has no existence, its place being taken by isolated groups of very rough, rugged mountains. These seem to owe their origin to a series of disconnected uplifts, which have taken place in different directions and at different periods. The river systems are divided from each other by almost imperceptible waterpartings. Many glacial lakes not marked on existing maps—some of large size—were met with. A striking fact is the close affinity which this country possesses with Siberia, not with Mongolia. The climate, scenery, people, flora, and fauna, are all Siberian. Dense forest covers the greater part of the surface, the dry Mongolian flora beginning to appear only in the valley-bottoms and southern slopes of the hills around Cha-kul. The region is inhabited in small numbers by the

Urianchais, who show greater affinities to the southern Siberian tribes than to the Mongols. In the remote upper valleys in the heart of the forest, nomads were encountered, living in birch-bark wigwams, and entirely dependent for their subsistence on their herds of domesticated reindeer. The existence of these animals within the Chinese Empire is of great interest, the more so as proof was obtained that reindeer are indigenous to the country, being found in a wild state also. The further route of the party was to be westward up the valley of the Kemchik (giving an opportunity for investigating the Tannu-ola mountains *en route*) and across the Altai to Chuguchak and Kulja, which last would be reached probably about the end of October. Owing to the inaccuracy of existing maps, a careful survey of the whole route through the upper Yenesei region had been made by Messrs. Carruthers and Miller, some 1800 square miles being mapped. They had also secured a good number of zoological specimens, while considerable botanical and geological collections had been made by Mr. Price.

Polar.

Exploration in Spitsbergen.—During the past summer a Norwegian expedition, under the command of Captain Gunnar Isachsen, has done a large amount of exploring work in the island of Spitsbergen. The expedition left Hammerfest on June the 22nd, and on the way to Spitsbergen stopped at Bear Island, where some survey work was done. A large amount of oceanographical observations were also made *en route*. A landing was effected at West Spitsbergen early in July and the various members of the party surveyed and mapped the region between St. John's Bay, King's Bay, Ekman Bay, and Wood Bay. Captain Isachsen also climbed the Diadem peak, and the expedition sounded the whole of the long Foreland Sound between Prince Charles Foreland Island and West Spitsbergen. A complete series of meteorological observations was also made. The most interesting of the observations was the discovery of an extinct volcano and hot springs in the vicinity of Wood Bay. The volcano, which is built up by lapilli and cinders, is situated on the west side of Bock Bay, in lat. 78° 28′ north, long. 13° 28′ east of Greenwich. The cone itself is formed very regularly and is like the top of Vesuvius or Etna, with the exception that the loose stones of the volcanoes in Italy are more slaggy, while the great stones here chiefly consist of olivine; the small ones resemble the lapilli that cover Pompeii. The volcano is situated on one of the sides of a fjord which, together with the way it has been built up, shows that its eruption took place in the quaternary period, after the formation of the fjord. The cone, consisting of stones ejected and crowded together, is isolated, and is cut through by layers of lava. The cone reaches a height of about 1650 feet. The volcano juts up in the vicinity of a north-south running fault, which forms the boundary between Devonian sandstone and granite.

The hot springs, eight in all, are situated in a straight line, two in a NNW. direction from the volcano, and the other six at a greater

distance SSE. at the bottom of Bock Bay. They are all situated at a slight elevation above the sea. The water in the springs has a temperature of 75°-82° F. The water in the most northern springs flows out of lime-tuff, deposited by the springs themselves in the shape of cones, which are broad at the base but low. The six springs to the south of the head of Bock Bay are the most interesting. A couple of them have a large flow of water, and the single spring may consist of a series of basins of lime-tuff arranged in steps. They resemble the springs in New Zealand and in the Yellowstone Park in North America. The basins are not large, often only a few yards across, but very beautiful with stalactites. At some of the springs the number of basins is very large: they may be counted by scores, and, if the small ones are included, by hundreds. Gas bubbles are continually rising from the bottom. That some subterranean action is going on is evident from the noise to be heard every now and then from the earth below the springs.

Commercial Geography.

Trade of the Port of Dairen.—A Consular Report (Cd. 4962-116) on the trade of Dairen (Dalny) gives some interesting facts in regard to this port, which is now the principal outlet for the produce of South Manchuria. The exports during the year 1909 were valued at £4,370,000, an increase of over three-quarters of a million on the figures for the previous year. Soya beans and bean products accounted for 70 per cent. of the total, but the sudden large demand in Europe, and especially in the United Kingdom, for these products has led to certain disturbances of the market. Prices are going up, and it is believed that there will be a large increase in the amount of land put down to beans this year in North Manchuria.

Next in order of value after beans and bean products in the list of exports come wild silk cocoons and silk thread. The rearing of the wild silkworm, which is carried on in a large part of South Manchuria, and more particularly around Kaiping, Kwantien, Fengwhangcheng and Antung, is one of the important industries of the agricultural class in these districts. The total production of South Manchuria is difficult to estimate, but last year the export to Chefoo, where the silk is spun, woven and re-exported, was 140,000 baskets, each basket containing 30,000 cocoons. For many years the cocoons and wild silk of South Manchuria have been imported into Chefoo, via Newchwang and Antung, but during the past two years large quantities have passed through Dairen also, and it has been felt that the port offers splendid facilities for the manufacture of silk yarn, etc.

The imports during 1909 showed a marked decrease, due chiefly to the diminution in the amount of building material required for the South Manchurian Railway Company.

Proposed Canal from Riga to Cherson.—Ever since the days of Peter the Great, Russian engineers have been desirous of connecting the Baltic and Black Seas by a navigable inland waterway by means of the

Düna and Dnieper, but hitherto no practical steps have been taken. The fact that the important ports of Riga and Cherson occur at the mouths of the two rivers named would greatly increase the importance of such a waterway, and details of a somewhat elaborate project are now being worked out. The project includes the improvement of the upper course of the Düna, a connection between the upper Düna and the Dnieper, and the improvement of the Dnieper. The difficulties are very considerable, owing especially to rapids on both the Düna and the Dnieper, but on the other hand it is expected that the exploitation of the power of these rapids will yield a considerable revenue. Another scheme proposes the connection of the Düna with the Volga, and the two schemes together would form the network of a vast scheme of water communications, comprising the whole of Russia. A special commission has been appointed to consider these various schemes.

New Swiss Railways.—The international competition for the heavy tourist traffic to Switzerland and Italy leads to constant minor improvements, each great line striving to gain some slight advantage in distance, time, or convenience, as compared with the others. It seems probable that the completion of the tunnel through the Lotschberg will increase the traffic through the Simplon, as it provides a direct communication between Berne and the Rhone valley. The other lines are, therefore, already attempting to discount this probable advantage by improvements on their routes. The federal railways of Switzerland have recently decided to drive a new tunnel under Monte Cenere, a mountain 1807 feet high, lying between Bellinzona and Lugano, with the object of shortening the St. Gothard route. The new tunnel will shorten the distance between Milan and Lucerne by about half an hour, and will also diminish the risk of delay, which is considerable at present on this section owing to the steep gradients and the sharp curves. The journey from Paris to Lausanne is also to be shortened by a new tunnel through Mont d'Or in the southern Jura, near Vallorbe. Another scheme of some interest is that to link up Disentis, in the Vorder Rhine valley, and the mouth of the Simplon tunnel at Brieg by a tunnel of more than a mile in length, which is to run below the Furka Pass, and thus connect Chur directly to the Rhone valley.

EDUCATIONAL

In vol. xxv. p. 552 we noted here the publication of an American volume entitled *The Interpretation of Topographic Maps*, by Messrs. Salisbury and Atwood, and indicated its usefulness to teachers. We have recently received another publication which follows somewhat similar lines, though it has proportionately far more text and much fewer plates. This is General Berthaut's *Topologie*, a publication in two large volumes, issued by the Geographical Service of the French Army, and primarily intended for the use of officers in training for the topographic service.

In the preface the author defines topology as the reasoned study of topographic forms. He points out that the progress of geographical knowledge is gradually making clear the causes of surface relief, as determined by erosion, deposition, and the structure of the crust. It is not therefore now sufficient for the topographer to study the best methods of representing surface relief, he must also understand why particular forms appear in certain localities, and what relation the different forms bear to each other. By a careful study of many examples he can learn that similar causes should everywhere produce similar land forms, except where these forms are modified by local conditions. As the progress of French surveys, both in the mother-country and in Algeria and Tunis, has produced many fine examples of the topographer's art, it is possible to illustrate a general account of surface relief by large-scale maps of French territory, and this is done in these volumes.

But it is obvious that while the prime object of the book is, as stated above, to train young officers, yet it may also be used by the teacher in the difficult task of explaining the abstract notation employed in topographic maps There is as yet no work of this kind on British Ordnance Survey Maps, and although the present volume is in some respects less suitable for the teacher's purpose than *The Interpretation of Topographic Maps*, it has the great advantage of dealing with a country relatively near at hand, and one which it is the custom to study in more detail than the United States of North America. Most of the examples are taken from maps of France, though Algeria, Tunis, and even Switzerland furnish illustrations of special problems. Among the many problems treated we select a few which seem of particular interest.

Considerable space is devoted to the land forms which occur in limestone regions, with examples from the Jura, the Causses and elsewhere. An interesting map of a part of the latter region, taken from the Rodez sheet, shows the marked contrast between the upper and lower reaches of the rivers. The rivers rise in an area where the rocks are impermeable, and there they have many tributaries, which interlace and cut the country into a mass of hills and valleys, in normal fashion. Below, as soon as the now-considerable streams enter the limestone region, they receive practically no more tributaries, owing to the circulation being chiefly underground, and they run at the bottom of broad cañons, in a district of limestone plateaux, with no valleys save the deep gorges. The contrast between the two types of relief seen in the same map is very striking.

As a contrast with the modelling of limestone regions two examples of argillaceous plateaux are discussed. It is indicated that in this case the soft nature of the soil prevents the formation of effective drainage channels, which fill up, as it were, as rapidly as they are excavated. There is thus a very immature condition of drainage, and practically no surface relief at all. The water tends to stagnate in pools or marshes, rendering the country unhealthy and unproductive. The examples given are the Sologne, a plateau included in the angle between the Loire and Cher, between Blois and Ramorantin, and the Dombes, a similar plateau lying to the east of the Saône, between the Rhone and Veyle. The

latter is covered with glacial clay, and is believed to be the remains of a great cone brought down by the Rhone on its emergence from the Jura in an interglacial period. Both regions, as the map shows, are largely covered by lakes and pools.

Other interesting subjects discussed and illustrated by maps are the phenomena visible in recently glaciated regions, such as over-deepening of valleys, the occurrence of "steps" in valleys, hanging tributaries, etc. A work of the same type dealing with the British area and illustrated by reference to Ordnance Survey maps would be of great use in the teaching of physical geography, but in its absence teachers may find General Berthaut's discussions and illustrations interesting.

NEW BOOKS.

EUROPE.

Sicilian Ways and Days. By Louise Caico. With 128 Illustrations. London: John Long, Limited, 1910. *Price* 12*s.* 6*d. net.*

We recommend this book to our readers. It is the work of an English lady now married to a Sicilian, and to whom has thus fallen special opportunities of passing behind the veil which conceals the inner life of the people from the casual visitor. And the work has been charmingly done, with sense, and humour and much sympathy.

The province of Caltanissetta is the only one in the island not washed by the sea, and in its remoteness it has preserved more touch with pagan times than possibly any other portion of Europe. The custom, lately common, of carrying deceased persons in an arm-chair round the village, the Easter wandering of the Virgin in search of her Son, are distinct survivals of pagan mythology. Even within the Christian period, such features as the chanting of litanies by the reapers, their constant invocation of San Calogero, and the tender and quaint stanzas sung in the Christmas *novena* are of great archaic interest.

Among the many curious observances of to-day are the celebration of Easter day on the Saturday, the measuring of time by the sun and the services of the church *e.g.*, "Bring the horses at the Benediction hour", the artificial relationship of *compari*, when even brothers address each other with the formal *voi* in place of *tu*, the veto upon the use of umbrellas by women as improper in their sex. The personal note attracts one throughout, but notably in the chapter "My Room," and the concluding one, "A Summer Day at Montedoro," with its wholly unexpected finale. The writing is spirited and vivid—at times there is even a suspicion of Italian in the English—and the many photographs give point to the whole.

ASIA.

Sport and Travel in the Far East. By J. C. Grew. With 80 Illustrations from Photographs by the Author. London: Constable and Co., Limited, 1910. *Price* 10*s.* 6*d. net.*

This interesting volume is the work of an American traveller who "turned eighteen months to good account in seeing as much as possible of foreign lands," combining "the maximum of sport with the minimum of stereotyped sight-seeing." Some of the chapters have already appeared in *Harper's Magazine*, *Outing*, and the *Badminton Magazine*.

The travels here recorded took Mr. Grew to the Malay Peninsula, to Northern India, to New Zealand, to Kashmir, to China and to Japan, these several countries being visited in the order mentioned. Most interesting chapters are devoted to accounts of the hunting of ibex, markhor, shapu, and black bear in different parts of the mountains of Kashmir, and of tigers in China. Throughout the book is brightly written, giving vivid pictures of the different places visited. The photographs are good and well reproduced, some of them being extremely interesting. One closes the volume with the wish that it were longer.

One or two varying descriptive passages may be quoted as specimens of the book. Here is Benares: "The alley-ways which intersect the town are none too wide to accommodate the stream of passers-by; but as almost every square foot of public highway is privately appropriated progress becomes almost impossible. Here a merchant has his brass and tin wares spread upon the pavement; a little further along, a farmer squats among his vegetables in the middle of the way; a step more and you have to pass gingerly by a barber who sits on his haunches before the employer of his services, both in the same attitude, occupying all but a fraction of the highway. Then comes a sacred bullock, wandering lazily along, bedecked with the flowers of pious worshippers; he stops to help himself casually from the vegetables and fruits of the poor but unresisting farmer, and continues his course among the wares of the merchants, which he scatters to right and left, while pedestrians edge up against the walls of adjacent buildings to give him ample room. There are many hundreds of these sacred animals in Benares, and to injure or restrain them in the pursuit of their fancies would be an act of impiety which would be visited by the utmost wrath of the protecting gods. Filthy temples open from the alleys at every few steps, and within, filthy priests receive contributions of money and food for the propitiation of their respective deities. Beggars literally swarm at their thresholds; in no city of the world are the beggars so numerous and so hideously disgusting as at Benares; maimed, blind, paralysed, diseased, they gather from every part of India, and crowd before the temples where the pious will not overlook their appeals. But repulsion overcomes one's sense of pity and prompts one to hurry past."

Another vivid passage is that which describes an eruption of the volcano of Waimungu in New Zealand as follows:—"Five minutes had scarcely elapsed from the moment that we had stood within the crater. My camera was pointed down for a photograph from the summit of the cliff, and I had made the exposure. Then, even before there was time to change the plate, the surface of the pool began suddenly to seethe. I heard B. at my elbow shouting, "My God, man, the thing 's going off!" But his voice was quickly drowned in the fearful uproar that immediately ensued. For Waimungu was in eruption; the formerly placid pond was shot in one terrifying blast into the air far above our heads, black water, black mud, black rocks, and following them with the hissing of a thousand rockets and the roar of a thousand cannon, a burst of whitish steam quickly outstripped and enveloped the uprushing mass. The explosion was awe-inspiring, terrible, grand, beyond comparison. No more appalling, yet fascinating spectacle can exist; no greater satisfaction can be experienced than to see such a phenomenon at close range. The sight alone, I am sure, is worth the travelling thousands of miles of land and water to behold. The outburst had taken place in the hundredth part of a second; almost immediately we were pelted with the sand and small stones which fell as the exploded mass shot back into its crater, causing us to take refuge in the shelter-hut provided for that purpose on the summit of the cliff. In a moment all was over; the pond regained its usual placid surface, and no sign save the continued shower of sand told of the mighty eruption which had taken place."

Here is Kashmir :— "The country through which we passed on this side showed Kashmir at her loveliest and best. One felt as if one were crossing, continuously crossing, the well-kept grounds of a huge private estate, and at any moment might come upon the towers and chimneys of some lordly mansion. There was no road. One passed over the greenest of grass, smooth and fresh as any lawn, extending as far as one could see, except where groves of wide-spreading chenar-trees cast their shade like oaks on a country park. Roses—not our wild ones, but such roses as at home are brought to flower only under hothouse panes—and wild flowers of all colours and species grew along our way and filled the air with fragrance. . . . I spent the night with pillow and blanket out under a clear sky, till toward morning a sharp rain drove me to seek shelter in the house of the headman of the village. Here my bed was a handful of straw scattered on a baked-mud floor with stuffy atmosphere and smells indescribable—a radical and unwelcome change."

In Lotus-Land Japan. By HERBERT G. PONTING, F.R.G.S. London : Macmillan and Co., Limited, 1910. *Price* 21*s. net.*

Of late years we have had an abundance of books about Japan, but the volume now before us has exceptional merits of its own, which will ensure it a hearty welcome. It is the work of one who is avowedly an intense admirer of the Japanese ; he is a master of their language, and has resided long enough in the country to write with authority on what he has seen. It is evident also that he was able to ingratiate himself with Japanese of all ranks, and that he was conversant with, and scrupulously adhered to the various intricate rules of etiquette which are of so much moment in Japan, and the neglect of which by foreigners, either because of ignorance or of rudeness, causes much misunderstanding or worse. Then Mr. Ponting has the eye and the spirit of an enthusiastic artist, and is capable of enjoying and describing the skill, patience, and genius bestowed on the production of an exquisite jar or of a highly tempered swordblade, as well as the beauty and glory of a chrysanthemum show or a sunny landscape. Add to this that he has from experience formed a very high opinion of the social and domestic qualities and life of the Japanese, of which he has seen a great deal, and he is never tired of portraying them to his readers. We need not look in this book for learned disquisitions on history, politics, or economics, a fact for which we may be very grateful. Mr. Ponting revels in glowing, eloquent descriptions of ancient temples, lovely landscapes and seascapes, artists at their work in making enamelled ware and the like. Then we have graphic and interesting descriptions of local festivals and stirring events which occurred in Japan during the course of the late war, and exciting personal narratives of ascents of volcanoes, shooting rapids, etc. The writer spent four days on the top of the famous volcano Fuji, during the greater part of which he was the involuntary witness of a terrific hurricane, but he received an adequate reward by seeing the sun rise over the surrounding country, a sight in praise of which he exhausts his vocabulary.

To the majority of our readers the great attraction of the book will be the numerous illustrations, some in colour and the majority in monochrome, for which nothing but the highest praise can be given. There is plenty of variety of subject, so that the taste of all sorts of readers will be gratified. If we had to make a choice, we should pronounce in favour of the landscapes and seascapes, which of themselves substantiate Mr. Ponting's claim to a place in the first rank of photographers, and justify his selection as photographer to accompany Captain Scott's expedition to the South Pole, where we are glad to think he will have ample scope to exercise and develop his great artistic powers in a new sphere.

Sport and Travel in both Tibets. By Lady Jenkins. London: Blades, East and Blades, 1910. *Price* 10*s.* 6*d. net.*

This dainty volume of eighty-seven pages, printed with wide margins, contains reproductions of some twenty-five sketches made by the authoress, during an expedition to Tibet, daringly undertaken by her alone (that is, without any European companion), together with notes from her diary. The sketches, in colour, are very effective, and the book as a whole leaves the reader with the wish to learn more of a lady's very unusual experience. Her native "shikar" feared her hands were too small for rifles, and her feet for the endless stony places she would have to march over, but was re-assured when he heard from her Indian servant of her former journey to Somaliland, and that she had shot fifteen tigers in India. She had in fact shot five.

She calls the journey from Srinagar to Leh a "wonder-way," on which she passed through many different lands and climates. At first she rode through lovely pastures of sweet grass, and fields of grain, and waving Indian corn, through meadows carpeted with flowers, meadow-sweet, wonderful pink mallows, wild roses, and festoons of the bridal creeper, mountains rising sheer on either side, fringed and draped with firs and pines, and the slopes below with great walnut-trees, and whitey-green willows; again passing through deep gorges where the loose stones reflected the heat, making the air hot and dry as an oven, where the dust was awful, and her face and lips began to crack; then, after the Zogi-La pass, the way is one long horror of dust, scorching sun, and landslips, so that to any one with a bad head for heights the road would be impossible (two Englishmen she met here were horrified to hear she was going farther, and assured her it was a country fit only for suicides); and yet again, when 15,000 feet above sea-level, with peaks of 2000 to 5000 rising all round, she felt the horrible sensation known as mountain sickness—terrible headache, and after every twenty minutes' sleep, a dreadful awakening, imagining she would die gasping for breath if she remained lying down.

Lady Jenkins describes some strange customs. At Ladak she found the marriage customs extraordinary; polyandry is the rule, one woman being the wife of all the brothers in a family. All the children are regarded as the children of the eldest brother, and inherit his property at his death to the exclusion of the younger brothers. Divorce is easy. If the wife and the eldest brother do not agree, they separate, and she may marry another family of brothers, without consulting the younger brothers of the first husband. After nine marriages, she becomes a widow.

In Tibet tea parties were a trying experience. Instead of sugar and milk, a piece of rancid butter, and a pinch of suttoo (a sort of flour), are put in a wooden cup: it is then stirred with the finger—your own if you are quick enough, and brave enough, to put it into the boiling tea,—otherwise it is politely done for you by the "never-yet-has-been-washed" finger of the man squatting next you. It must then be drunk and the cup licked clean, before being put in the breast of your sheepskin coat.

Lady Jenkins tells of her success in shooting various kinds of game,—gazelle, antelope, shapu, bharal, barrasingha, ibex, and markhor. Pangong Lake was reached far in the interior, an expanse of water forty-five miles long,—the water of which is described as of a hard rich blue, changed at midday into a shimmering pink by the reflection of the sandstone hills around. It is salt, and there are no fish, while no cattle or wildfowl break the oppressive stillness along the shores. Many high passes were crossed,—Phobrang at 14,500 feet, Marsemik at 18,500, Lankak La at 18,000, Lungnak and Chang La at 18,300.

At Leh, the Lamas were polite and showed the Great Lama's throne with immense pride. Quaint manuscripts with their wooden bindings filled a whole room. But

the smell of the universal filth of Tibet was very present in all the monasteries, "the heightening touch being given to the bad smells by the living odour of burning rancid butter used in the lamps before the altars."

The return journey to Leh is not detailed.

AMERICA.

Argentina. By W. A. Hirst. With an Introduction by Martin Hume, M.A. London: Fisher Unwin, 1910. *Price* 10*s.* 6*d. net.*

Mr. Hirst's book is a thick but not very extensive publication. Thick paper, together with 64 photographic plates and a map, expands its 308 + xxviii pages into a fat squat volume, but as the work is comprehensive in its scope the reader who looks at the actual amount of printed matter must be prepared for a rather sketchy treatment of some of the topics handled in it. The whole of the general geography of the country, including the climate, is disposed of in the first fifteen pages, but it is only fair to add that the geography of different regions of the country, such as Patagonia and the Gran Chaco, is further dealt with in other parts of the book. Chapters II.-IX. treat of the history of the country, including its settlement and progress in recent times, and though here also the treatment of the subject is necessarily rather summary, these chapters may be cordially recommended to readers in this country as containing some very instructive and profitable reading for them. Other chapters contain an account of the constitution, the condition of the people, agriculture and other industries, religion, etc., which are all described in an interesting manner from first-hand knowledge. A bibliography and index conclude the book.

Notwithstanding all that we have to thank the author for we cannot but regret that his methods have not been a little more thorough and his exposition somewhat clearer and more definite. His account of the climate, for example, cannot be considered satisfactory. On p. 5, for example, we are told that "the winter is cold, the summer decidedly hot," without even any indication of the part of Argentina that the author has in view in this rather vague statement. On p. 13, where the provinces of Buenos Aires, Santa Fé, San Luis, Mendoza, and parts of Cordoba are expressly spoken of, we are told that "the climate is temperate, with mild winters and moderately hot summers," and further down on the same page he gives a table which, he says, shows that in the city of Buenos Aires the extremes are not rigorous. What that table actually gives is the temperatures at 2 P.M. and 9 P.M. for each month of the year, but we are not told whether these are really "extremes," or means for the month at those hours, and, if means, for what period the means have been calculated. We may guess that the figures give means in degrees F. (January, 82° at 2 P.M., 71·2° at 9 P.M; July, 55·2° at 2 P.M., 47° at 9 P.M.), but we are left to conjecture. Another table on p. 14 giving particulars of temperature and rainfall for a number of stations in different parts of the republic is offered as giving a rough idea of the climate of the country, but is not very well fitted for that purpose. What is given is the mean temperature (apparently for the year, the least instructive datum that could have been selected), the maximum temperature (no statement as to whether it is an absolute shade maximum, and, if so, for what period), and the rainfall. Still more disappointing is the inadequacy of what he says on the productiveness of the country. On p. 5 we are told of "the rich tilth and fine pasture" of the Pampa, where "red and white beasts graze and fatten, standing knee-deep in the fresh grass," and this fertility is emphasised also by Mr. Hume in his introduction (pp. xxiv, xxv). Still it is notorious that the average yield of wheat in Argentina is far below that of the Canadian North-west,

and yet that the total production of wheat in Argentina and the export of that commodity from that country have been increasing at a much more rapid rate than in Canada, in fact so rapidly that the author's anticipation (p. 226) that before long Argentina will lead the world in the export of wheat seems likely to be justified. One would like to see some light thrown upon these facts. It may be that the explanation is to be found in a fact that Mr. Hirst deplores, that the Argentine government is not making the same efforts as that of Canada to build up its agriculture on the basis of a numerous body of small landowners. "In general," he says, "the farmer is not rooted to the soil; he merely pays a percentage of his crop to the landlord as rent, and after a bad season is apt to move elsewhere," and he adds, "it is said that the best lands have been snapped up by speculators." Perhaps this system encourages the rapid spread of that slovenly extensive system of agriculture which Mr. Hirst regrets (but which is not confined to Argentina among new countries) to a greater extent than the North American system, but if that is the explanation or an important part of the explanation of what we have called attention to, we should like to have had more details upon the subject and a full and careful discussion of a problem so interesting and important.

Le Mexique et ses Mines d'Argent. Par Albert Bordeaux. Paris: Plon-Nourrit et Cie, 1910. *Prix* 4 *frs.*

Mexico has, through wise administration, attained such a high place politically and financially and seems to have such a great future, if wise government continues, that any description of it by a competent explorer is welcome. Like many travellers who wish their books to last for ever, M. Bordeaux rather conceals the date of his visit to Mexico, but we gather from page 204 that it was in 1906, a date sufficiently recent to make his observations applicable to Mexico of to-day. The author travelled from New York in a luxurious railway train to El Paso, opposite Ciudad-Juarez, the first Mexican city, and proceeded by train to Durango, with its celebrated "mountain of iron," 650 feet high, where he witnessed a bull-fight. He went next to Zucatecas and its famous silver mines, with which the country near it is honeycombed. Then he proceeded to Guanajuato, whose mines have been even more productive than those of Zucatecas, and have realised fabulous fortunes.

At last he reached Mexico, the capital, 6600 feet above the sea-level, occupying one of the most picturesque sites in the world, with a magnificent cathedral dating from 1573, and other fine public buildings, and with lovely environs. He left it in a motor car for the silver mines of Sultepec and Temascaltepec. He also visited the mines of Oaxaca, which, "like all Mexican mines, are subject to violent fluctuations in value." The miners are "very exacting, eating or drinking all they gain, and making no provision for the future." Apart from mines, however, the author remarks that "Mexico has made great progress during the last ten years, Mexicans are gifted with much intelligence, and it is possible that they will some day astonish us in science and art. At one time they possessed the highest civilisation in all America." He next visited the mines of El Oro and Dos Estrellas, the most celebrated recent gold mines, and then discusses the development and antiquities of Mexico, remarking that the chief factor in the enormous development of the Mexican silver mines is that they occur almost always in temperate regions, while gold and copper occur in the tropical zone. He considers that the ancient Indian monuments of Mexico prove the existence of a civilisation as advanced as that of ancient Egypt. The museum at Mexico contains monoliths representing the gods of war and of fire as well as an enormous

serpent's head and a colossal human head in diorite. He describes the ruins found throughout Mexico, the temples and pyramids, and the ancient cities, one of which had a population of 300,000. Other chapters recounting the author's travels in the west of North America, and a map indicating the silver mines of Mexico complete, with illustrations, a volume which is as instructive as it is interesting.

GENERAL.

Distant Lands: An Elementary Study in Geography. By H. J. Mackinder, M.A. London: Geo. Philip and Son, 1910. *Price* 2*s.*

This volume is a continuation of the series of geography readers which Mr. Mackinder has been publishing, the other members of which have been already reviewed here. In the present book the distant lands of America, Africa, Asia, etc., are introduced through the medium of historical accounts of the exploration of the world. The conquering and colonising races also are distinguished as shipmen, horsemen, and camelmen, according to the means by which they reached new lands. Later in the book, when the various regions of the globe have thus been introduced to the scholar through history, we have more general chapters of the nature of a summing up, and introducing general problems, such as climate, latitude, and longitude, and so forth. The book is as attractive and interesting as previous members of the series, and criticism can only dwell upon minor points. We rather doubt, for example, the advisability of teaching children to call all the great running birds ostriches. Why not simply Running Birds? The treatment of marsupials also in the chapter on distribution is, we think, likely to give rise to misconceptions. But the book as a whole is a great addition to the school library. It is to be followed by still another volume dealing with the races of the world.

A Physiographical Introduction to Geography. By J. A. Herbertson, M.A., Ph.D. Oxford: At the Clarendon Press, 1910. *Price* 1*s.* 6*d.*

This physiographical introduction was originally prepared as an introduction to Dr. Herbertson's *Senior Geography*. It is now issued separately, so that it can be used at any stage. The merits of the series of geographies to which the present book belongs are so well known, that further praise is perhaps unnecessary. We hope, however, that teachers recognise sufficiently the need for using them as a supplement to personal teaching, and not as a means of replacing it. For example, the "action of ice" has here about a page devoted to it, a page which gives the main points accurately enough; but we cannot help feeling a doubt whether a child or even an adult could get from the reading of this page, without further instruction, any clear ideas on the subject, owing to the excessive condensation. Similarly, it seems to us that parts of the sections on the distribution of plants and animals will only be fully intelligible to those already well acquainted with the subject, and may give rise to wrong ideas in others. In other words, the book is, as the preface states, a succinct summary, and must be used as such, and be copiously supplemented from the teacher's stores of knowledge.

BOOKS RECEIVED.

African Game Trails: An Account of the African Wanderings of an American Hunter-Naturalist. By Theodore Roosevelt. With Illustrations from Photographs by Kermit Roosevelt and other Members of the Expedition, and from Drawings by Philip R. Goodwin. Demy 8vo. Pp. xvii + 534. *Price* 18*s. net.* London: John Murray, 1910.

Our Search for a Wilderness: An Account of Two Ornithological Expeditions to Venezuela and to British Guiana. By Mary Blair Beebe and C. William Beebe. Illustrated with Photographs from Life taken by the Authors. Demy 8vo. Pp. xix + 408. *Price* 10*s.* 6*d. net.* London: Constable and Co., Ltd., 1910.

Climate of the Argentine Republic. By Walter G. Davis (Argentine Republic Department of Agriculture). Ry. 8vo. Pp. 111. With 44 Plates. Buenos Ayres: Argentine Meteorological Office, 1910.

The Channel Islands of California: A Book for the Angler, Sportsman, and Tourist. By Charles Frederick Holder. With nearly 150 Illustrations from Photographs, and 12 Maps. Demy 8vo. Pp. xvi + 397. *Price* 7*s.* 6*d. net.* London: Hodder and Stoughton, 1910.

Hungary. By Stephen Bársony, Dr. Jules Bodnar, Dr. Samuel Borouszky, Dr. Béla Erodi, Béla Gonda, Dr. William Hanko, Dr. Louis Loczy, Theodore Novak, Dr. Villibald Semayer, Charles Siegmeth, Dr. John Sziklay, and Dr. Ladiolas Toldy. Edited for the Royal Hungarian State Railways by Albert Kain. 4to. Pp. 400. *Price* £2, 10*s.* Budapest: Hungarian State Railways, 1910.

Hunting Camps in Wood and Wilderness. By H. Hesketh Prichard, F.Z.S. With a Foreword by Frederick Courteney Selous. Illustrated by Lady Helen Graham, E. G. Caldwell, and from Photographs. Cr. 4to. Pp. xiv + 274. *Price* 15*s. net.* London: William Heinemann, 1910.

The Personal Life of David Livingstone, LL.D., D.C.L.: Chiefly from His Unpublished Journals and Correspondence in the Possession of His Family. By William Garden Blaikie, D.D., LL.D. With Portrait and Map. Demy 8vo. Pp. xix + 504. *Price* 15*s.* London: John Murray, 1880.

(Presented by Mrs. Hugh Rose.)

Nigerian Studies: or the Religious and Political System of the Yoruba. By R. E. Dennett. With Illustrations. Demy 8vo. Pp. xiii + 232. *Price* 8*s.* 6*d. net.* London: Macmillan and Co., 1910.

Guide to Geographical Books and Appliances: The Second Edition of "Hints to Teachers and Students on the Choice of Geographical Books for Reference and Reading." By H. R. Mill, LL.D., D.Sc. Revised by A. J. Herbertson, M.A., Ph.D., and J. F. Unstead, M.A., and Nora E. Macmunn. Demy 8vo. Pp. viii + 207. *Price* 5*s.* London: Published for the Geographical Association by G. Philip and Son, Ltd., 1910.

The Face of Manchuria, Korea, and Russian Turkestan. By E. G. Kemp, F.R.S.G.S. Illustrated by the Author. Large Fs. 4to. Pp. xv + 247. *Price* 7*s.* 6*d. net.* London: Chatto and Windus, 1910.

The Glory of the Shia World: The Tale of a Pilgrimage. Translated and edited from a Persian Manuscript. By Major P. M. Sykes, C.M.G., assisted by Khan Zahadur Ahmad Din Khan. With many Illustrations in the Text, and four coloured reproductions from Persian Paintings. Demy 8vo. Pp. xiv + 279. *Price* 10*s. net.* London: Macmillan and Co., 1910.

The British Empire in Pictures: A Geographical Reading Book. By H. Clive Barnard, M.A. 4to. Pp. 64. *Price* 1*s.* 6*d.* London: Adam and Charles Black, 1910.

Le Far-West Chinois: Kientchang et Lolotie. Impressions de Voyage, Etude Géographique, Sociale et Economique. Par Le Dr. A. F. Legendre. Ouvrage accompagné d'une carte et de gravures. Cr. 8vo. Pp. 471. *Prix* 5 *francs.* Paris: Librairie Plon, 1910.

Economic Geology, with Special Reference to the United States. By Heinrich

Ries, A.M., Ph.D. New and Revised Edition. Demy 8vo. Pp. xxxi + 589. *Price* $3·50. New York: The Macmillan Co., 1910.

Normandy and Brittany: Cook's Tourists' Handbook. New Edition. Thoroughly Revised and Remodelled. With Maps and Plans. Cr. 8vo. Pp. viii + 264. *Price* 3*s.* London: Thos. Cook and Son, 1910.

A Voice from the Congo: Comprising Stories, Anecdotes, and Descriptive Notes. By Herbert Ward. With Illustrations from Photographs, Sculpture, and Drawings by the Author. Demy 8vo. Pp. xv + 299. *Price* 10*s. net.* London: William Heinemann, 1910.

Lanarkshire. Cambridge County Geographies. By Frederick Mort, M.A., B.Sc., F.G.S. With Maps, Diagrams, and Illustrations. Cr. 8vo. Pp. vii + 168. *Price* 1*s.* 6*d.* Cambridge: University Press, 1910.

Farthest West: Life and Travel in the United States. By C. Reginald Enock, F.R.G.S. With 32 Illustrations and a Map. Demy 8vo. Pp. xvi + 323. *Price* 15*s. net.* London: John Long, Ltd., 1910.

Three Years in Tristan Da Cunha. By Mrs. K. M. Barrow. With 37 original Illustrations from Photographs, and a Map. Demy 8vo. Pp. xii + 280. *Price* 7*s.* 6*d. net.* London: Skeffington and Son, 1910.

A First Book of Physical Geography. By W. Maclean Carey, M.A. (Cantab.), B.Sc. (Lond.). Crown 8vo. Pp. viii + 156. *Price* 1*s.* 6*d. net.* London: Macmillan and Co., 1910.

Melanesians and Polynesians, their Life-Histories, described and compared. By George Brown, D.D. With Illustrations. Demy 8vo. Pp. xv + 453. *Price* 12*s. net.* London: Macmillan and Co., 1910.

The Earth and its Story. By Arthur R. Dwerryhouse, D.Sc., F.G.S. With 5 coloured plates and 116 other Illustrations from Photographs and Drawings. Medium 8vo. Pp. 364. *Price* 5*s. net.* London: Charles H. Kelly, 1910.

Mining in Japan, Past and Present. Demy 8vo. Pp. iv + 322. Published by the Bureau of Mines, The Department of Agriculture and Commerce of Japan, 1909.

The Chronicle of a Pilgrimage, Paris to Milan on foot. By Harold Monro. Crown 8vo. Pp. vii + 134. *Price* 2*s.* 6*d. net.* London: Sampson Low, Marston and Co., Ltd., 1910.

Nottinghamshire (Cambridge County Geographies). By H. H. Swinnerton, D.Sc., F.Z.S., F.G.S. With Maps, Diagrams, and Illustrations. Cr. 8vo. Pp. xi + 153. *Price* 1*s.* 6*d.* Cambridge: University Press.

Uganda for a Holiday. By Sir Frederick Treves, Bart., G.C.V.O., C.B., LL.D. With 72 Illustrations from Photographs by the Author and a Map. Demy 8vo. Pp. xi + 233. *Price* 9*s. net.* London: Smith, Elder and Co., 1910.

Mountaineering in the Land of the Midnight Sun. By Mrs. Aubrey Le Blond. Demy 8vo. Pp. xii + 304. *Price* 10*s.* 6*d. net.* London: T. Fisher Unwin, 1910.

Rare Days in Japan. By George Turnbull Ladd, LL.D. Illustrated. Demy 8vo. Pp. xiv + 341. *Price* 10*s.* 6*d. net.* London: Longmans, Green and Co., 1910.

Physical and Commercial Geography: A Study of Certain Controlling Conditions of Commerce. By Prof. Herbert Ernest Gregory, Prof. Albert Galloway Keller, and Prof. Avard Longley Bishop. Ry. 8vo. Pp. viii + 469. *Price* 12*s.* 6*d.* London: Ginn and Co., 1910.

Au Brésil: De l'Uruguay au Rio Sao Francisco. Par Paul Walle. Préface de M. E. Levasseur. Demy 8vo. Pp. xx + 444. *Prix* 8 *fr.* 50. Paris: E. Guilmoto, 1910.

Catalogue of the Fresh-water Fishes of Africa in the British Museum (Natural History). Volume i. By GEORGE ALBERT BOULENGER, F.R.S. Imp. 8vo. Pp. xii + 373. London: British Museum Natural History, 1910.

Guide to the Specimens Illustrating the Races of Mankind exhibited in the Department of Zoology, British Museum. Pp. 32. *Price* 4*d.* London: British Museum, 1908.

Memorials of Charles Darwin exhibited in the British Museum. Pp. v + 50. *Price* 6*d.* London: British Museum, 1910.

Guide to Mr. Worthington Smith's Drawings of Field and Cultivated Mushrooms, and poisonous or worthless Fungi often mistaken for Mushrooms exhibited in the British Museum. Pp. 24. *Price* 1*s.* London: British Museum, 1910.

A Guide to the Domesticated Animals (other than Horses) exhibited in the British Museum. Pp. 54, *Price* 6*d.* London: British Museum, 1908.

Guide to the Whales, Porpoises, and Dolphins (Order Cetacea) *exhibited in the British Museum.* Pp. 47. *Price* 4*d.* London: British Museum, 1909.

Guide to the British Vertebrates exhibited in the British Museum. Pp. iv + 122. *Price* 1*s.* London: British Museum, 1910.

An Introduction to the Study of Rocks, and Guide to the Museum Collection. Fourth Edition. Pp. viii + 155. *Price* 1*s.* London: British Museum, 1909.

Guide to the Crustacea, Arachnida, Onychophora, and Myriopoda exhibited in British Museum. Pp. 133. *Price* 1*s.* London: British Museum, 1910.

Waterways in Eastern Bengal and Assam. Preliminary Report on the improvement for navigation of the most important waterways of Eastern Bengal and Assam. By C. A. WHITE, M.I.C.E. August 1909. Second Issue. Shillong, 1910.

Observations made at Laurie Islands, South Orkneys, in the Year 1904. By the Director, WALTER E. DAVIS. Buenos Ayres: Annals of the Argentine Meteorological Office, 1905.

The Official Year-Book of New South Wales, 1908-9. By J. B. TRIVETT, F.R.A.S., F.S.G. New South Wales, 1910.

Maryland Weather Service. Vol. iii. Baltimore, 1910.

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THE SCOTTISH GEOGRAPHICAL MAGAZINE.

THE DEEP SEA.[1]

By Sir JOHN MURRAY, K.C.B., F.R.S., etc.

(*With Illustrations.*)

THE various planets by which our own Sun—as well as other suns—are surrounded are believed to be in different stages of evolution. Some of them may still be hot enough to emit light; others, like Neptune, Saturn and Jupiter, are in the molten stage. Our Earth is in the terraqueous condition: it has both oceans and dry lands, while on the surface of Mars the oceans seem to have disappeared. On the Moon the air as well as the water has now disappeared from the surface—the Moon is in the dead stage. Our Earth, then, is in the terraqueous stage, and if we study in detail its deep oceans, we may form some idea of the past history of our planet, while, if we study attentively the surface of the planet Mars, we may in like manner catch some glimpses of the state of things to which we are advancing—a parched and thirsty planet covered with vast deserts.

If again we contemplate this globe of ours as it is swung in space, we may with the mind's eye see that it is composed of concentric spheres. The great internal mass of our Earth we call the *centrosphere*. It is removed from direct observation, but astronomers tell us that it is much heavier than the rocky crust with which we are well acquainted. We infer that the interior is largely composed of metallic elements, and this opinion is in a way confirmed by the composition of the lodes and veinstones which are largely made up of emanations from the interior of the Earth. This great centrosphere is believed to be solid as steel, and as it slowly contracts from loss of heat by radiation and conduction the rocky

[1] Summary of lecture delivered to the Royal Geographical Society in Edinburgh on Nov. 11, 1910.

crust by which it is surrounded is crumpled and thrown into folds while accommodating itself to the shrinking nucleus.

Between the hot solid centrosphere and the cold solid *lithosphere* there is a sphere which may become fluid or viscous according to variations of temperature, of pressure, and of chemical composition. This we call the *tectosphere*.

We are all better acquainted with the three external spheres of our Earth—the *lithosphere*, the *hydrosphere*, and the *atmosphere*—with earth, water, and air. Wherever these three meet and interpenetrate, there we have a development of life,—what we may call the *biosphere*. If we wish to give our imagination still more rein, we may say that within the biosphere a *psychosphere* has been evolved,—human intelligence attempting to interpret the whole, as we are now doing. This evening we shall limit our remarks to that portion of the water-sphere which is called the "deep sea."

It is often said that where there is no water there can be no life; it is equally true to say where there is no earth or no air, there can be no life. From the general considerations which have just been indicated, it might have been inferred that life would have been found everywhere throughout the ocean even in its deepest recesses. When, however, the great *Challenger* Expedition returned to this country in 1876, after having spent three years in the exploration of the great ocean basins in all parts of the world, the one result that riveted the attention of the public was the discovery that living organisms were to be found everywhere in the ocean from the surface waters down to depths of three or four geographical miles. Men were indeed surprised to learn that large and delicate organisms belonging to nearly all marine groups could flourish in these great depths, where the pressure was over four or five tons to the square inch, where sunlight never penetrated, and where the temperature approached the freezing-point. Some of these new and strange animals were reminiscent of forms hitherto known only in the fossil condition, and some of them exhibited novel and interesting adaptations to the extraordinary conditions of their environment. Fishes of frail, fantastic form were in a pitiable condition when drawn up to the surface. The gases within their bodies had expanded owing to the gradual diminution of pressure, and as a consequence their eyes were blown out of their heads and their stomachs out of their mouths. It was also found that very many of these organisms had the power of emitting a pale blue phosphorescent light from special and peculiar organs—after the manner of searchlights—and of thus illuminating the otherwise eternal darkness.

FIG. 1.—Radiolarian ooze.

The floor of the deep sea was shown to be carpeted in places by oozes composed of calcareous and siliceous shells—the houses of pelagic creatures built and tenanted in the surface waters and fallen to the bottom on the death of the tenants—or the bottom was covered with red clay, mixed up in which were hundreds of sharks' teeth and bones of whales, some of them belonging to extinct species, as well as zeolitic crystals, manganese nodules, and metallic particles and chondres of extraterrestrial origin—the tails of meteorites, in short. Lastly, it has been found that these deep sea deposits contain more radioactive matter than any of the continental rocks: in one inch of red clay there is more radium than in the whole overlying layers of sea-water four miles in depth.

Scientific men had evidently invaded a new and weird field of research, attractive in a surpassing degree to all who take an interest in the advance of natural knowledge. The modern science of oceanography was practically founded by the *Challenger* Expedition and has since been extended by expeditions sent out by nearly all civilised countries, by private expeditions, like those of the late Professor Alexander Agassiz and the Prince of Monaco, by Arctic and Antarctic expeditions, by telegraph ships, by the work of marine laboratories, and especially by the International Fishery Investigations in the North Sea. The physical and biological conditions of the deep sea are now known in their broad general outlines. Let us briefly glance at these conditions.

Thousands of soundings recorded from all parts of the ocean show that the sea-floor may be regarded as vast undulating plains submerged on the average about two and a half miles beneath the surface of the waves, interrupted here and there by submarine ridges and cones, some projecting above the surface as coral and volcanic islands. The greatest *depth* known is in the Challenger (or Nero) Deep in the North Pacific, viz., 5269 fathoms, or 31,614 feet, in which our highest mountain, Mount Everest, might be placed and yet be covered by 2600 feet of water. The greatest depth in the Atlantic is 4662 fathoms, in the Nares Deep, north of the Virgin Islands. The greatest depth in the Indian Ocean is 3828 fathoms in the Wharton deep, south of Java. The term "deep" is applied to those areas of the sea-floor where the depth exceeds 3000 fathoms or three geographical miles. Fifty-six such deeps are now known, including ten areas where the depth exceeds 4000 fathoms, and four areas where the depth exceeds 5000 fathoms, or five geographical miles.

The *salinity* of the sea is highest where drying winds blow over the surface as in the trade-wind regions, the Red Sea and the Mediterranean, decreasing towards the poles and in the deep sea. But although the amount of salt in solution varies from place to place, and at different times of the year, the composition of sea-salts remains nearly uniform, only slight variations having been detected along continental shores, in polar regions, and in the water intimately associated with deep sea deposits.

The *temperature* of the sea varies at the surface from 28° Fahr. towards the poles to over 80 Fahr. towards the equator. The annual range of temperature is small—less than 10 degrees Fahr.—in the

polar regions, where the actual temperature is low, and also in the tropical regions where the actual temperature is high, and between these areas of small range lie two zones of wide range. This large range of surface temperature is most pronounced in those regions where there is an alternation of warm and cold currents with change of season, resulting in an enormous mortality among organisms living in the surface waters. As examples of such regions of large range may be mentioned the Atlantic coasts of North America and off the Cape of Good Hope. In these localities there is an extra large supply of dead organic matter falling to the bottom, and here the greatest hauls of deep-sea animals are taken in the trawls and dredges. Here also the deposits are characterised by the formation of glauconitic and phosphatic nodules.

Beneath the surface the temperature of the ocean-water rapidly decreases in the tropical regions—the warm surface water forming a relatively very thin film,—so that the great mass of the ocean consists of cold water, usually under 40° Fahr. in all depths greater than 1000 or 1500 fathoms. The deposit brought up by the dredge from deep water under the equator, with a broiling sun overhead, is so cold that the hand cannot be placed in it without great discomfort.

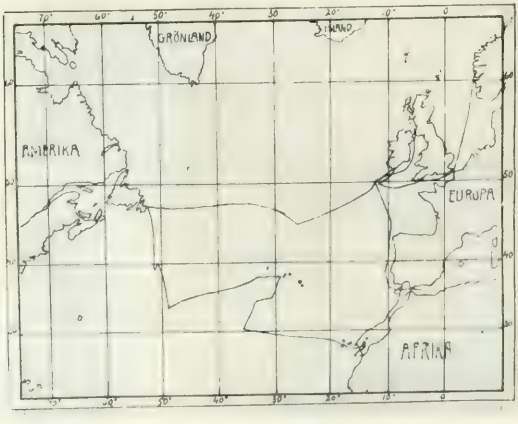
The *atmospheric gases*, oxygen and nitrogen, are absorbed at the surface of the sea to a greater extent in cold than in warm regions, and are then carried down to the deepest parts of the ocean by the general circulation kept up by the action of the prevailing winds of the globe. Oxygen is required by marine animals and therefore is used up as it passes down to and over the bottom in the greatest depths, while the nitrogen is unaffected. There is no deficiency of oxygen anywhere in the open ocean where a general circulation is maintained, but in basins cut off from this circulation by submarine barriers, like the Mediterranean, there may be great deficiency, and in the Black Sea there is not enough to support life in the deeper layers of water.

The ultimate *source of the food* of all marine animals is the plant-life along the shores and especially in the surface waters of the ocean, where, under the influence of sunlight and chlorophyll, organic compounds are elaborated from inorganic compounds. The surface of the sea down to several hundreds of feet is crowded with myriads of minute unicellular Algæ, forming vast floating meadows. The actual amount of vegetable life at the surface of the sea is probably much greater—although so inconspicuous—than that which clothes the land surfaces. Not only are these floating meadows the feeding-grounds of surface animals, but when their dead remains fall to the bottom they supply food to the mud-eating animals which crawl over the ocean-floor, and these in their turn are eaten by predatory deep-sea creatures. Nowhere in the ocean does there seem to be an absence of life, but the regions of the very deep sea far removed from land may be called deserts when compared with the teeming life of the surface and shore waters.

Such then may be regarded as a general summary of our knowledge of the deep sea at the present time. The work of the *Challenger* Expedition over a quarter of a century ago has been confirmed and extended in

The *Michael Sars*.

The centrifuge on the deck of the *Michael Sars*.



The track of the *Michael Sars*.

many directions, but no very striking or entirely novel discoveries have been made by subsequent expeditions, and the enthusiasm for deep-sea explorations appears to have died away in quite recent years.

Let us now consider the circumstances which led to the *Michael Sars* Expedition during the present year. When Wyville Thomson and Carpenter investigated the Faroe Channel to the north of Scotland in the earliest deep-sea expeditions, they met with temperatures at three-quarters of a mile in depth varying as much as 15° Fahr. in a relatively short horizontal distance, 30° Fahr. in one place and 45° Fahr. in another. Now the *Challenger* investigations in all parts of the world seemed to render it highly improbable that two such bodies of water could exist alongside of each other without an intervening rocky barrier. In consequence the *Knight Errant* and the *Triton* Expeditions were sent out to re-investigate this area, and a barrier reaching up to within 250 fathoms of the surface was discovered separating the cold Arctic water from the warm water of the Atlantic; not only so, but the fauna trawled from either side of this ridge were found to be quite different, only a few of the 500 species captured being common to the two areas.

During the past ten years the Norwegians have been doing a great deal of work in the Norwegian Seas and have brought together great collections from deep and shallow water. It seemed desirable to have collections from different depths along the coasts of the British Isles, Europe, and Africa, for comparison with those from the far north. Instruments and methods of deep-sea research have also been much improved within the last ten years. It was desirable to try these in the deep water areas of the North Atlantic, and to explore in a special manner the intermediate waters of the open ocean with modern appliances. Besides it seemed as if the time had arrived to attempt not so much the capture and description of new species as to find out the interdependence of oceanic phenomena and their bearing on the wide general physiological and economic problems of the ocean.

In November last year I offered through my friend, Dr. Hjort, to pay all the expenses of a four months' cruise in the Atlantic if the Norwegian Government would grant the use of their fishery boat, the *Michael Sars*, for these purposes. The reply was favourable. The *Michael Sars* was a rather small ship for Atlantic work, being only 125 feet in length; on the other hand she had a trained captain and crew, and the scientific staff was accustomed to taking observations even in very rough weather.

The instruments used in deep-sea work are all of special construction (some of them are here exhibited). Moreover they are all removed from direct observation when at work, and it is not known until they again reach the surface whether or not they have properly functioned. Their proper working is therefore a source of much anxiety to the practical oceanographer. A thermometer must be reversed by a messenger at the depth at which the temperature is desired; a water-bottle must in like manner be reversed and closed at the depth from which a sample of water is required, and so on in other operations.

The ship proceeded along the coasts of Europe as far south as the

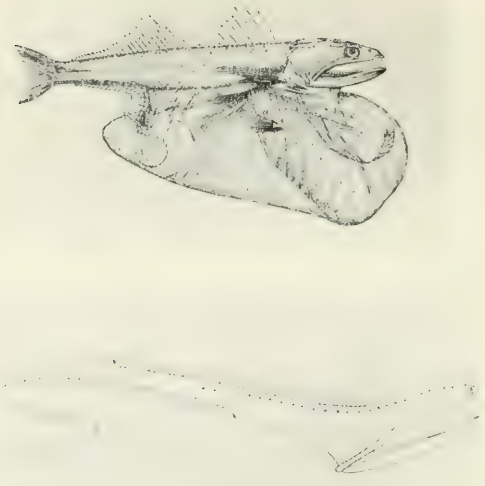
Cape Verde Islands, making special observations in the Straits of Gibraltar on the way. She then proceeded to the Sargasso Sea and back to the Azores, afterwards crossing the Atlantic to St. John's, Newfoundland, and returned to Scotland, following the course of the Gulf Stream or North Atlantic Drift. The improved apparatus now in use allowed a very large number of temperature and salinity observations to be taken as well as other physical and biological observations. These details and results will be published as soon as possible.

By using a large otter trawl in the greatest depths it was hoped that large new fishes and cuttle-fishes might be captured which had hitherto escaped. This hope was not realised; but still the trawl was worked successfully down to a depth of three miles, and abundant collections were secured for future study. The fish-fauna in the coastal waters extending from the Norwegian Sea to the coast of Africa at the Canaries varied with latitude and temperature, but along the continental slopes, between 500 and 1000 fathoms, the same species of fishes were found over this long stretch.

Professor Helland Hansen, by means of an ingenious apparatus which could be opened and closed at any desired depth, made some interesting observations as to the distance to which the sun's rays can penetrate sea-water. At 50 fathoms, during bright sunshine and after an exposure of two hours, all colours of light were found to be present, though many of the red and green rays were cut off. At 300 fathoms red and green rays could not be detected; some blue rays were present, but the light consisted principally of ultra-violet rays. At 500 fathoms some light was still detected, but at 900 fathoms, *i.e.* about one mile of depth, the photographic plates were unaffected even after long exposure.

The *Michael Sars* sailed specially prepared to examine the fauna and flora of the open ocean down to and beyond the distance to which sunlight penetrates, and in this the expedition has been, in my opinion, a marked success. Various sizes and kinds of nets and trawls were used in the intermediate waters, some hauled horizontally, some vertically, and a great many animals were captured between 300 and 1000 fathoms which were formerly believed to live near the bottom, such as black fishes and large red crustaceans. Occasionally as many as twelve nets were drawn along at different depths, and the results were compared with those obtained by vertical nets at the same place. These results were interesting when considered in connection with the light observations. The black and red animals captured in 300 fathoms would be invisible when viewed from the surface layers; on the other hand the crystal-clear and blue animals which float on the surface would be invisible when viewed from the deeper layers.

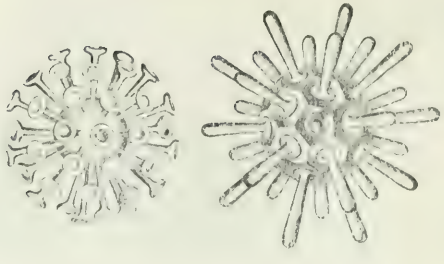
Great attention was paid during the whole cruise to the young fishes and fish-larvæ found floating in the surface and sub-surface waters. This expedition was undertaken—at all events so far as I am concerned—simply with the view of increasing natural knowledge, but one can never tell when one may stumble across results of economic importance. Let me give an example. You all know that the salmon enters freshwater rivers from the sea for spawning purposes, and after-



Two Deep-sea Fishes.

The upper figure shows a specimen of *Chiasmodus niger*, obtained in the North Atlantic at a depth of 1500 fathoms, which has swallowed another fish larger than itself.

Leptocephalus.



Rhabdospheres (Coccolithophoridæ).

wards returns to the ocean. With the common eel it is the reverse: it lives in the fresh water and descends to the ocean to spawn, the young returning to the rivers and lakes as elvers. Now, in recent years it has been shown that the larvæ of eels are small transparent fishes known as *Leptocephali*. These are continually found in the tow-nets, but the very young stages and the ova of the eels have never been found in the ocean and the geographical position of the spawning grounds is as yet unknown. Now along the continental slopes, and in the North Atlantic north of the Azores, we found full-grown *Leptocephali* and transformation stages, as Dr. Schmidt and others had done before us, but to the south of the Azores we found that all the eel larvæ were younger than any hitherto captured, and although the ova have not—so far as the examination has proceeded—been found, still our observations point, according to some of my colleagues, to the spawning area of the common eel being situated somewhere in the southern part of the North Atlantic, probably between the Canaries and Bermuda. This observation may in the not distant future have a direct bearing on economic fishery questions.

The day before the ship sailed from England a large centrifuge was purchased and fixed to the deck to be driven by a steam winch. Water

FIG. 2.—One of the Coccolithophoridæ.

was collected from different depths in the ocean by means of the water-bottle, and placed in the centrifuge, which was then rotated. In this way all the minute organisms in the sea-water were collected in the bottom of the rotating tubes, and could be examined under the microscope and counted. Professor Gran found that vast numbers of unicellular plants were present in all the surface layers of the ocean—especially the Coccolithophoridæ. As these all escape through the meshes of the finest silk used by the German Plankton Expedition, it

seems certain that the general results of that expedition will require to be very considerably amended.

The samples of deep-sea deposits obtained during the cruise confirm previous observations, but the stones brought up by the trawl over the area are of exceptional interest. These are being examined by Dr. Peach, and he reports that fully 20 per cent. are glaciated fragments. They consist of granite, gneiss, shales, sandstones, chalks, limestones, and flints, and some of these contain fossil remains. The condition of these fragments shows that in many instances they projected above the surface of the deposit in which they were imbedded. Dr. Peach has no doubt that these stones were carried by ice during the later phases of the glacial period to the position in which they were found. They almost all belong to the series of sedimentary, metamorphosed, and erupted rocks now found *in situ* in this country and in Ireland. But the interesting question is: why have these fragments not been completely covered up by the shells which are continually falling from the surface? Telegraph engineers give reasons for believing that in some localities and depths the rate of accumulation is at least one inch in ten years; at this rate all rock-fragments deposited during the glacial period should have been buried in the ooze far beyond the reach of the trawl. Most probably the tidal currents, which our observations showed to exist in deep water, extend right down to the bottom and remove the small Globigerina shells from any ridges. Still there may be other explanations of the facts.

Mixed up with these stones is a remarkably large number of cinders from steamers. If steamers using coal should some day be superseded by vessels using some other kind of fuel, then the deposits in the North Atlantic would have a layer which might be called the coal-fuel layer. On the other hand, if the coal-cinders and these glaciated rock-fragments are now lying together on the floor of the ocean, geologists may in the remote future find proofs in these layers that man and steamers existed in the glacial period.

I have referred to only a few of the results and observations taken during this four months' cruise. When published in detail these will form a substantial addition to knowledge, and it is in my opinion almost certain that they will lead to other and more extensive explorations of the same nature in the immediate future.

A LAKE SURVEY EXPEDITION IN GERMANY: TEMPERATURE OBSERVATIONS IN THE MADÜSEE.

By E. M. Wedderburn, W.S.

(With Illustrations.)

In the *Magazine* for November 1909 and February 1910 there have appeared short articles dealing with temperature oscillations in

lakes,[1] so that it is unnecessary to explain again what the nature of these oscillations is.

From the second article it will be gathered that Professor Halbfass, formerly of Neuhaldensleben and now of Jena, was doubtful whether a temperature seiche, such as had been observed in some of the Scottish lakes, would be found in any of the German lakes, unless they were very narrow and unless the wind always blew along the lake, from either end, and not across it.

As the author was anxious to convince Professor Halbfass that even in Germany a temperature seiche must exist in lakes, he proposed to him that in the summer or autumn of this year a joint expedition should be made to some lake of his choosing, and systematic temperature observations made. Professor Halbfass at once accepted this offer and chose the Madüsee in Hinterpommern as the scene of operations. This lake is one of the largest, though not the deepest, in North Germany, and is situated about twenty miles east of Stettin, and runs north and south. Fig. 1 gives a sketch map of the lake and surroundings, showing the depth contours for each 10 metres. The maximum depth of the lake is about 42 metres.

Professor Halbfass[2] had previously made a careful survey of the lakes of Pomerania and was familiar with the district. He was therefore able to make preparations in advance, so that, when the observations were begun, everything worked smoothly, and there was no hitch from any cause which could have been foreseen.

The Madüsee has also been subjected to careful examination by Dr. Samter,[3] by whom a map with depth contours, on the scale of 1 : 25,000 has been published. The character of the basin is, therefore, well known. It is fairly regular throughout, and the lake consists of a single basin, but there is a sudden widening of the lake near Seelow (see map). The shores of the lake are very shallow and are covered everywhere with reeds. A glance at the map will also show that at the south end of the lake there is a large area of very shallow water. We know from Chrystal's work on the *Theory of Seiches*, that shallows, such as this, and sudden variations in breadth, interfere greatly with the exact calculation of the period of an ordinary seiche, and that where the seiche is of large amplitude, these shallows are certain to cause irregularities in the period. This also must be the case with the temperature seiche. It will be gathered from this that the Madüsee has not an ideal conformation for the observation of temperature seiches, but it was of a convenient size, was easily accessible, and had previously been subjected to an elaborate survey, so that the physical condition of the lake was well known. These factors induced Professor Halbfass to suggest the Madüsee as the scene of operations, and his choice was justified by the result.

[1] A general description of temperature oscillations in fresh-water lakes will be found in vol. i. of the *Report on the Scientific Results of the Scottish Lake Survey*. Challenger Office, Edinburgh, 1910, p. 29.

[2] Beiträge zur Kenntnis der Pommerschen Seen. *Pet. Geogr. Mitt. Ergänzungsheft*, 136. 1901.

[3] Der Madüsee. *Archiv für Naturgeschichte*. 71 Jahrg., 1 Bd., 3 Heft. Berlin, 1905.

The country in Pomerania is very flat, and there are no high hills along

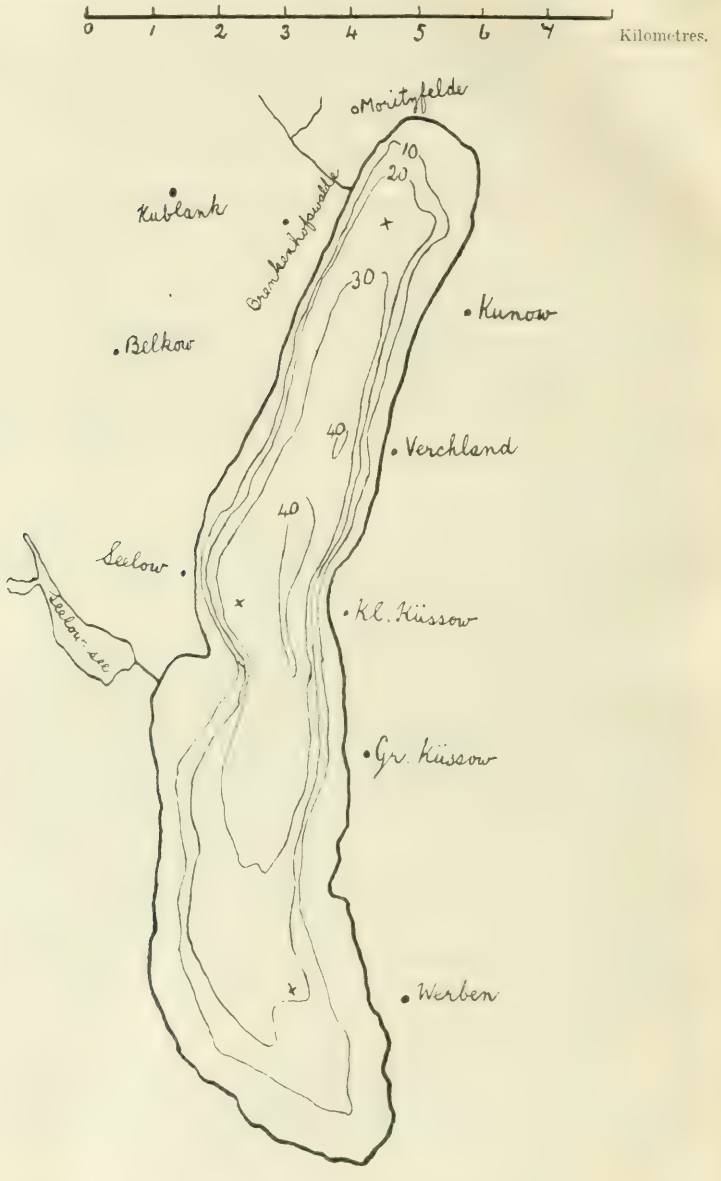


FIG. 1.—Map of the Madüsee.

the shores of the lake. The wind is therefore not forced to blow along

the lake. All varieties of wind direction were experienced, and at times the direction of the wind at the two ends of the lake differed. In settled weather with light winds there was usually a diurnal variation in wind direction from the north-west through north to north-east.

The survey party from this country consisted of the author and his former Loch Ness boatman, Mr. William Macdonald. They were joined later by Mr. W. H. Ogilvie, Broughty Ferry. The apparatus taken consisted of four Negretti and Zambra deep-sea thermometers in reversing frames—most of them loaned by the Challenger Office. Professor Halbfass procured the assistance during the whole period of Herr Knieriem, student of geography from Bad Nauheim, and Herr Müller, student of

Group of Observers. From left to right:—Messrs. Ogilvie, Halbfass, Macdonald, Knieriem, Wedderburn, Müller.

geography, Aachen. He was also assisted at various periods by Herr Referendar Herms, Tempelburg, Herr Philipp and Herr Berkholz of Pyritz, and Herr Piper, Superintendent of Fisheries. Herr Dorow, the lessee of the fisheries, also gave considerable help, in the way of boats, and his motor boat frequently acted as courier from one part of the lake to the other. To all of these gentlemen the author desires to express his thanks for their assistance, which was generously and freely given.

Professor Halbfass had at his disposal two reversing thermometers of different types. One which was lent by the Seewarte in Hamburg was unfortunately lost. A wind meter was lent by the Kgl. Pr. Meteorological Institute in Berlin, and wire ropes and a current meter by the Institute for Meereskunde in Berlin. The observers were therefore well supplied with thermometers, and these on being compared with one another were all found to agree to within 1° C., which was the limit

of accuracy aimed at. One of the thermometers taken from this country had a Kew certificate. For the most part a line or wire rope marked in metres was used for lowering the thermometers. These lines were frequently compared with a metre scale, and shrinkages in the line were corrected or allowed for.

The regular observations commenced on 25th July and were continued till 14th August, and in that time about 3000 temperature observations were made. To commence with, three observation points were fixed, shown by crosses on the map, at Werben under the charge of Professor Halbfass, at Seelow under charge of the author, and at Moritzfelde of Herr Knieriem and Herr Müller. For the most part a series of observations was made simultaneously at these stations three or four times daily.

Survey boats at Werben.

Observations were made every two hours, from 8 a.m. on 30th to 6 p.m. on 31st July at Werben and Moritzfelde, and from 8 a.m. on the 30th July to 8 a.m. on 1st August at Seelow. On 8th August the observations at Seelow were discontinued and the observers there gave assistance at Werben and Moritzfelde. At the former station observations were made every two (or sometimes three) hours, from 8 a.m. on 9th to 4 p.m. on 12th August, and at Moritzfelde from 8 a.m. on 9th to 6 p.m. on 14th August. It was not originally intended to observe so long at this station, but the interesting nature of the results which were being obtained encouraged the observers to prolong their efforts. Their enthusiasm for the work is shown by the fact that some of them were for four days and nights practically without sleep. The weather during part of the time was stormy, which added to the discomfort and tiring nature of the work.

It is intended to reserve the more technical part of the discussion of the observations for publication elsewhere, and to indicate here only the general results of the investigation.

The diagram in Fig. 2 shows the depth at which a temperature of 12° C. was found at the various points of observation during the last

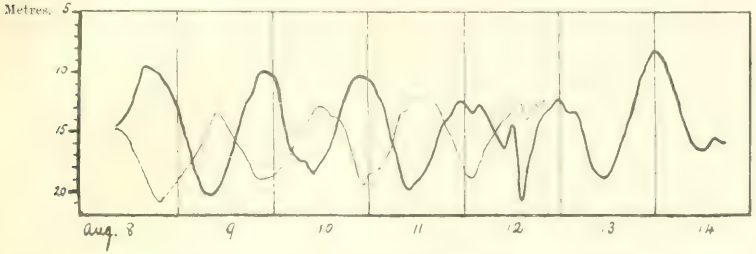
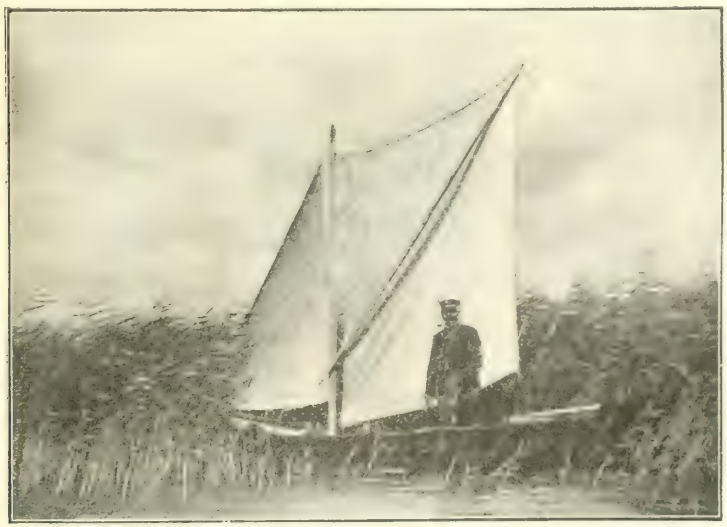


FIG. 2.—Madüsee, Aug. 1910 Oscillation of 12° C. isotherm.

week's observations. Time is measured along the horizontal axis, and depth, in metres, along the vertical axis. The dark line refers to Moritzfelde, and the light line to Werben. Of course the actual depth at which 12° C. occurred was not observed, but for the most part



Survey boat with Herr Fischer at her Pipe

observations were made every one or two metres of depth. Curves were drawn for each of these series of observations. By interpolation the depth for a temperature of 12° C. was obtained.

An examination of the diagram shows the existence of an oscillation of the 12° C. isotherm with a period of very nearly twenty-four hours.

And moreover, when the isotherm is rising at one end of the lake it is in general falling at the other end. The earlier observations show oscillations of the same nature, but as the observations are not so frequent the period does not appear so clearly. If it had been possible to make the observations continuously at intervals of two or three hours during the whole of the investigation the value of the work would have been greatly increased. But a much larger number of observers would have been required. The oscillations at Seelow, which is near the centre of the lake, were much smaller than at the ends, and were less regular, but on the whole they had the same phase as the oscillations at Moritzfelde. This means that if the oscillations are of the same nature as the seiche, the uni-node, or point where there is no vertical motion, must be between Seelow and Werben, but very near Seelow. But this is just what is expected from the theory of seiches, for the node is always nearer the shallow end of a lake, and towards Werben the lake is much shallower than towards Moritzfelde. The diagram, as above stated, shows the oscillations of the 12° C. isotherm. This isotherm was chosen because it is round about 12° C. that the most rapid change of temperature took place in the lake, as is shown by the following table, which gives the observations at the three stations at 8 p.m. on 27th July, which are typical of the temperature distribution in the lake during the observations.

Depth in Metres.	Werben.	Seelow.	Moritzfelde.
0	17·1° C.	17·4° C.	17·7° C.
10	16·2	—	—
11	15·1	—	—
12	13·4	17·2	—
13	11·8	16·3	17·6
14	9·8	16·3	17·6
15	8·9	13·4	17·5
16	8·2	10·7	14·6
17	7·8	—	10·2
18	7·6	9·7	9·2
19	7·6	—	8·4
20	7·6	8·9	7·9
21	7·6	—	7·7
22	7·5	—	—
30	—	7·5	—

It is not intended to burden this article with mathematical formula. It will be sufficient to say that the period of a temperature seiche in the Madüsee has been calculated on the assumption that there was a sudden discontinuity in temperature at 15 metres, and that the temperature of the upper and lower layers was respectively 17° C. and 8° C. This calculation, which was of rather an elaborate nature, and was made by an extension of Chrystal's[1] theory for seiches, gives a period of twenty-five hours for the temperature seiche, which is astonishingly close to the

[1] *Trans. R. S. E.*, xli. (III.), 599.

observed period. The calculation was made by the construction of a "normal curve" for the lake, as was done by Professor Chrystal[1] and the author for Lochs Earn and Treig. This normal curve is shown in Fig. 3, and it will be seen that it is of rather a complicated nature. The calculation of the period was made on the assumption that this curve could be replaced by a parabola.

Professor Halbfass has been converted by the observations, and is now a whole-hearted supporter of the temperature seiche theory. Of course the amplitude of the oscillations varies, and after a long period of calms they may die down to a very small amplitude and may be masked by other phenomena. During a period of changeable winds a regular

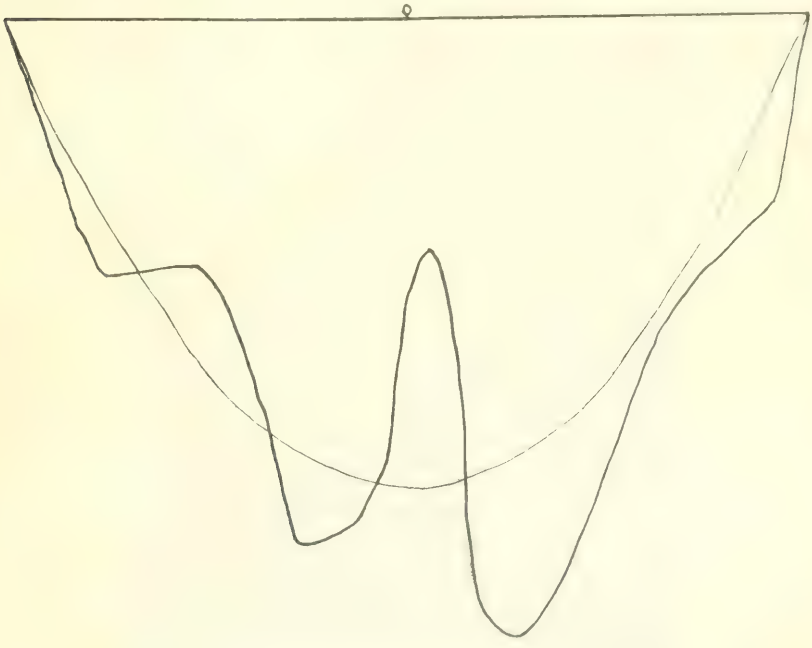


FIG. 3.—Normal curve for Madüsee.

temperature seiche is not to be expected, because, as a rule, the cause of the oscillation is the piling up of the warm surface water at the lee end of the lake, producing a tilt in the isotherms. The oscillations shown in Fig. 2 followed on strong southerly winds, and before these winds the oscillations were small and more or less irregular. On 13th August there were also high winds, and an increase in the amplitude of the seiche is shown in consequence.

But while Professor Halbfass now admits the existence of temperature

[1] *Trans. R. S. E.*, xli. (III.), 823. The "normal curve" has rather a different meaning when applied to the calculation of the temperature seiche. This will be explained in a later publication.

seiches, doubt has recently been expressed by Professor E. A. Birge,[1] Wisconsin, U.S.A. He has made an examination of the temperature observations made in Loch Ness, and comes to the conclusion that the oscillations there observed may simply be due to changes in meteorological conditions. He only examines in detail observations over a few days. It so happened that there were changes in the direction of the wind during the observations which he examined which nearly agreed with the period of the oscillation. The result was that the oscillations were large, and Birge is of opinion that they may be solely caused by the changes in the wind direction, but taking into account the whole series of observations in Loch Ness and other bodies of water there can be little doubt that the existence of the temperature seiche in lakes

Survey boat with Mr. Wm. Macdonald

where there is a temperature discontinuity is as universal as the existence of the ordinary seiche. Some lakes by their conformation are badly "tuned" for seiches. Examples of this are Garry and Lubnaig. In others, such as Earn and Treig, seiches occur, are started and maintained very easily and frequently. So no doubt some lakes are much more suitable than others for the occurrence of the temperature seiche, and observations in, say, Loch Earn would probably give excellent results.

[1] On the Evidence for Temperature seiches. *Trans. Wisconsin Acad. Sciences, Arts, and Letters*, xvi. (II.), 1005.

A scheme for desirable observations in a body of water such as Earn may be stated. Continuous two-hourly temperature observations should be made at four or more points in the lake simultaneously over a lengthy period, coupled with an accurate record of the meteorological conditions. Current measurements should also be made continuously, preferably at two or more points at each of the observation stations. If such observations were carried out at four stations the minimum in instruments required would be eight reversing thermometers and eight current meters, in addition to meteorological apparatus. Anemometers and sun recorders would be desirable instruments. If the observations were to be made continuously at intervals of two hours five or more observers would be required at each station.

It is believed that the results which would be obtained by such an investigation would be valuable. At present our knowledge of the temperature changes and current systems which occur is not accurate, but observations such as are suggested would give a fairly accurate record of all the changes which occur throughout the lake. It would enable current systems to be mapped, and it would also be possible to calculate the amount of heat gained and lost by the lake from day to day, and light would be thrown on many unsolved limnological problems.

BRITISH TRANS-AFRICAN RAILWAYS.

(With Map.)

In a recent number of *Questions Diplomatiques et Coloniales*[1] M. E. de Renty gives an interesting description of two most important railways, destined, when completed, to traverse Africa from north to south and from east to west. As he picturesquely expresses it: "Great Britain intends to cast across the Dark Continent a heavy Iron Cross, whose arms will extend from north to south between Alexandria and Cape Town, and from east to west between Lobito Bay and Beira. These extreme points, opened up by a continually increasing commerce, are being rapidly organised in order to form the principal centres of African trade, and to further the development of Greater Britain. While Britain does not possess the whole territory to be traversed by these railways, she will endeavour to obtain diplomatically, as she has hitherto sometimes done by force, what she desires. Germany and Belgium have been the only powers barring the route through German East Africa, and for a short distance its passage through the Congo Free State."

The project of a line from Cairo to the Cape issued from the brain of Cecil Rhodes, that magnificent pioneer who played so great a part in the expansion of Britain in Africa. At first people laughed at the idea, and even important Railway and Engineering publications in England received it sarcastically. They had not fathomed the deep colonial policy on

[1] 16th October 1910.

which such a railway was based. Its promoters thought not merely of piercing the Dark Continent, but had a much higher aim. They thought of the benefits Britain would gain when, after this iron road had been constructed, branch lines would carry to her ships products which they would bear over all the seas. Then would not the line itself with its thousand rails, engines, and carriages furnish work for Britain, and would not her colonists be the first to benefit by the line? Would not Britain acquire influence by bringing civilisation into a continent deprived for so long of light and peace, and for generations under the thrall of rulers trafficking in human beings? The emancipated Negro would hail the Briton as his deliverer from the cruel bondage of centuries. The idea was not only great and splendid, it was practical as well, for its realisation has not as yet been attended by any insurmountable obstacles.

Thus M. de Renty eulogises the Cape to Cairo railway conceived in 1889 by Cecil Rhodes. He then furnishes a sketch of its history, and points out that in 1889 only two railway lines existed which could be used for a Trans-African railway. The southern line was in Cape Colony, and extended from Cape Town to Kimberley, the great diamondiferous centre of South Africa. This line penetrated 647 miles into the interior of the Continent. The northern line was in Egypt, and extended to Cairo. In January 1898 it had reached Nag' Hamadi, where it crossed the Nile. Gradually it was extended to Shellal, 684 miles from Alexandria. From Shellal steamers took passengers up the Nile to Wadi Halfa, on the confines of the Sudan, then occupied by the Mahdists. Deducting the above transit by steamer to Wadi Halfa (214 miles), and that across Lake Tanganyika (400 miles), there remained 5399 miles of railway to construct in order to traverse the African continent from Alexandria to Cape Town, or double the greatest length of the United States of America from East to West.

In 1889 the British South Africa Company, having received its Royal Charter, was authorised to construct a line from Kimberley to Vryburg, which was prolonged to Mafeking in 1893. At the beginning of 1897 Palachwe was reached, showing 262 miles constructed in three years. On 19th October 1897 the railway was open to Bulawayo, or 227 miles from Palachwe, a work of only five months.

The first idea was that the Trans-African railway should, after reaching Salisbury, the capital of Rhodesia, be continued northwards towards Lake Tanganyika, but owing to physical obstacles this route was changed, and one passing through a large coalfield discovered in the Wankie district was preferred. Thus the line was continued from Bulawayo to the Zambesi, which it crossed by a magnificent bridge across the Victoria Falls, and then was pushed on to the mineral field of Broken Hill, 655 miles from Bulawayo, and 2017 miles from Cape Town. To attain Lake Tanganiyika from Broken Hill, the present railhead, 469 miles of railway would require to be constructed.

Turning now to the north, we left the railway at Shellal, which is situated beyond Assuan, and above the first cataract of the Nile, whence steamers carried passengers and troops to Wadi Halfa, passing *en route* the magnificent rock temple of Abu Simbel. One of the features of

British Trans-African Railways

Lord Kitchener's decisive campaign against the Mahdi was his laying down a railway from Wadi Halfa to Berber to facilitate the passage of his troops southwards on their march to Omdurman. The present writer was a witness of the activity which then reigned at Wadi Halfa in despatching the rails necessary for the construction of this railway.[1] While the ancient Pharaohs employed foreign slaves to construct the colossal buildings which symbolised their power, the British employed at Wadi Halfa Egyptian criminals who worked in chains, and carried from ships to trucks the rails which were to spread civilisation throughout Africa. When at the end of the campaign of 1898 the railway reached Khartum, the Trans-African line had been pushed 1375 miles south from Alexandria.

The capital of the Sudan was now the railway terminus, but the imperative order for the line to go south had to be obeyed. Some delay, however, was occasioned by the circumstance that it was found necessary that the line should pass through a small portion of Abyssinian territory. By treaty with the Emperor on 15th May 1902 this difficulty was surmounted, and on 1st January 1910 the line was continued from Khartum to Wad-Medani. But it did not end here, for the *Times* of 31st October 1910 announced that "on 1st November a new section of the railway south from Khartum is being opened to public traffic. Last January the section from Khartum to Wad-Medani on the Blue Nile was opened —a distance of about 100 miles—and from now the next 60 miles to Sennar will be open. A daily train each way will be run. From Sennar the line now under construction leaves the bank of the Blue Nile, and turning westwards, cuts across to the White Nile (about 80 miles), which it will cross at Kosti, where the new bridge is approaching completion. It is expected that the railhead will reach Kosti by the new year. From there the line will be continued westwards to El Obeid." Thus in the beginning of 1911 the northern portion of the Trans-African railway will, with the exception of the Nile transit from Shellal to Wadi Halfa, stretch from Alexandria to Kosti, a distance of 1713 miles. A railway had also been formed from Berber to Port Sudan on the Red Sea, enabling the products of the Egyptian Sudan to reach the ocean without the long journey to Alexandria.

Let us turn next to the southern portion of the railway. We left it at Broken Hill, its railhead, 2017 miles north of Cape Town. From there it is intended to be extended to Lake Tanganyika, 469 miles north of Broken Hill, and it was hoped that it might be continued through Congo territory from Lake Tanganyika northwards. In fact a treaty was made on 12th May 1894 between Britain and the Congo Free State, which stipulated that the latter should lease to the former a strip of land 15½ miles in breadth between the northernmost port on Lake Tanganyika and Lake Albert Edward. This lease, however, was never granted, owing to the objections raised by the German Government, and which were thus expressed in the *Tägliche Rundschau* of Berlin:—"The completion of the communication of British South Africa

[1] In January 1898.

with the Egyptian Sudan by means of a railway implies the certain ruin of our colonial empire in Africa. Such a railway would be of no economic advantage to our colony. It would only lead to our territory becoming a British Protectorate: and if ever the project were realised, it would give such an extraordinary impulse to British influence that soon there would be nothing left for us to do in Africa but to pack up and go." M. de Renty's comment on this is:—"So Britain did not insist. She knows admirably how to advance on the international chessboard a few of her pawns and to leave the rest alone, without, however, ever losing sight of the useful relation between the movement of the few and the immobility of the others."

While, therefore, some time must elapse before Alexandria and Cape Town form the two *termini* of the Trans-African railway, the British have not been idle. They have constructed numerous transverse lines, which will eventually be branches and feeders of the great central railway. They have, as already said, made a line from Berber to Port Sudan; another from Mombasa to Port Florence on Lake Victoria; a third from Beira to Salisbury and Bulawayo: a fourth from East London and Port Elizabeth to De Aar. "Thus," as M. de Renty says, "when once the project of Cecil Rhodes is executed, Africa will be spanned from north to south by an immense railway, and from this main line branches will extend eastwards to the open sea. To borrow the original remark made by an American review, "Africa will be placed, in a not far distant future, upon a gridiron made of British rails."

We have now discussed the Central Trans-African railway running from north to south. Let us turn to the other one running from west to east. As the former is associated with the name of Cecil Rhodes, the latter is with that of Robert Williams, who on 21st November 1902 formed an Anglo-Portuguese Company with the object of constructing a railway from Lobito Bay on the Pacific to Katanga on the Central Trans-African railway. This line was to extend some 938 miles. Starting from a well-equipped port on Lobito Bay formed by this enterprising Company, the railway line was pushed up to Cubal over a mountainous country, and already extends to nearly 156 miles in length. It is hoped that the frontier of the Congo Free State will be reached in about six years, viz., in 1916. Once there, the line will be continued to Katanga, and the great "Star of the Congo" mine, which is already in railway communication with Beira on the Indian Ocean, 1625 miles from Broken Hill. This port is situated in Portuguese East Africa, and seems destined to have a great future owing to its railway connection with the interior of Africa.

At the same time, in so far as the shipment of the produce of minerals of Katanga is concerned, Beira cannot compete with Lobito Bay, for Beira is distant from Europe and the United States, which are at present the great consumers of copper. Meanwhile the railway from Broken Hill to Beira is giving very satisfactory results, the receipts since January last averaging £20,000 per month.

The advantages derived by Britain from the construction of these Trans-African railways and their branches are self evident. Not merely

has her prestige with the natives been greatly increased, but she has furnished her own citizens with most remunerative labour during the past twenty years. "It is impossible," says M. de Renty, "to form an idea of the labour furnished to thousands of British workmen and engineers who have co-operated in the manufacture of the materials required by such vast enterprises." He concludes by raising the question whether the Portuguese will be able to control the two extremities of the line at Beira and Lobito Bay if the railway is made and managed by the British? As for the Trans-African line from Cairo to Cape Town, he declares that the moment it is completed the influence of Britain will dominate the entire Eastern side of Africa, and the Indian Ocean will become more and more a British lake.

RALPH RICHARDSON.

COMMANDER PEARY AT THE NORTH POLE.[1]

(*With Illustrations.*)

OUR readers do not need to be reminded that in May of last year Commander Peary, the distinguished explorer, who after years of toil and danger succeeded in reaching the North Pole, paid us a visit, and delivered to us an address in which he sketched the inception, progress, success, and return of his expedition. The address is printed *in extenso* in the August number of this *Magazine* for the present year, and thus we are relieved from the necessity of repeating details, which are doubtless well known to all our readers. In this book Commander Peary relates the whole story of the expedition with much greater detail than was possible in the limits of an ordinary address, and he has produced a volume of surpassing interest. It might be truthfully described as a description of the realisation of a dream; Commander Peary himself repeatedly refers to his "Polar dream." He had been interested in the Arctic regions so long ago as 1885, but the project of attempting to reach the Pole only took shape in 1898. Since then he has made no less than seven different attempts to reach it, six unsuccessful, the last of which was in 1905-6. He published an account of this expedition in his book *Nearest the Pole*, a review of which appears in the January number of this *Magazine* for 1908. These repeated failures, however, in no way altered his determination to make another attempt. He was no longer a young man, but he had pledged himself to the National Geographical Society at Washington, when he received the Hubbard medal and said: "To me, the final and complete solution of the Polar mystery, which has engaged the best thought and interest of some of the best men of the most vigorous and enlightened nations of the world for more than three centuries, and to-day quickens the pulse of every man or woman whose veins hold red blood, is the thing which should be done for the honour and credit of this country, the thing which it is intended that I should

[1] *The North Pole.* By Robert E. Peary, with an Introduction by Theodore Roosevelt. London: Hodder and Stoughton, 1910. Price 25s. net. [We are indebted to the publishers for the illustrations which accompany this article.—ED. *S.G.M.*]

An Ice Pinnacle near the shore.

Photo. Copyright of Robert E. Peary.

do, and the thing that I must do." The only results then of repeated defeats were to strengthen this determination and to extend and ripen his experience. For this, if for no other reason, viz., his unrivalled experience, he was already marked out as the explorer of all others who was most likely to accomplish the feat of reaching the Pole. Nansen, no mean authority, had seen this long before, and had said to President Roosevelt, "I think Peary is on the whole the best of the men now trying to reach the Pole, and there is a good chance that he will be the one to succeed."

Commander Peary himself points out that his success was mainly due to his experience. "Every possible contingency," he says, "that years of experience had taught me to expect was provided for, every weak spot guarded, every precaution taken. I had spent a quarter of a century playing the Arctic game. I was fifty three years old, an age beyond which, perhaps, with the one exception of Sir John Franklin, no man has ever attempted to prosecute work in the Arctic regions. I was a little past the zenith of my strength, a little lacking, perhaps, in the exuberant elasticity and *élan* of more youthful years, a little past the time when most men begin to leave the strenuous things to the younger generation; but these drawbacks were fully balanced perhaps by a trained and hardened endurance, a perfect knowledge of myself and of how to conserve my strength." This lengthened experience of Arctic conditions enabled him to prepare and forecast a plan of campaign which he had the good fortune to be able to carry out. It included the utilisation of Smith Sound as a land base nearest the Pole, a winter base at Cape Sheridan, the use of sledges and dogs and the employment of Eskimos.

As in his *Nearest the Pole*, so now in this volume, Commander Peary loses no opportunity of descanting on the many virtues of "his children" the Eskimos, and their exceptional usefulness for Arctic exploration and travelling. He dismisses in a single contemptuous sentence airships, motor cars, trained polar bears, etc., but of the Eskimo he says: "It has been a fundamental principle of all my Arctic work to utilise the Eskimos for the rank and file of my sledge parties. Without the skilful handiwork of the women we should lack the warm fur clothing which is absolutely essential to protect us from the winter cold, while the Eskimo dog is the only traction force suitable for serious Arctic sledge work."

It is satisfactory to find that the small tribe from which he selected his followers, and which had sadly dwindled down in numbers, has somewhat increased of late years. In 1905 they numbered only 207, but in 1908 they numbered from 220 to 230. "They are savages, but they are not savage; they are without government, but they are not lawless; they are utterly uneducated according to our standard, yet they exhibit a remarkable degree of intelligence. In temperament like children, with all a child's delight in little things, they are nevertheless enduring as the most mature of civilised men and women, and the best of them are faithful unto death. Without religion, and having no idea of God, they will share their last meal with any one who is hungry, while the aged

and the helpless among them are taken care of as a matter of course. They are healthy and pure-blooded, they have no vices, no intoxicants, and no bad habits—not even gambling. Altogether they are a people unique upon the face of the earth."

In our review of Commander Peary's previous work *Nearest the Pole*, we referred to the origin of the Eskimos. Commander Peary is inclined to accept Sir Clement Markham's theory that they are derived from the Onkilon, an ancient Siberian tribe, and he finds confirmation of this in their appearance, language, moral ideas, and character. It goes without saying that some of the customs, habits, practices, and notions which are described are primitive, and far from being in accordance with Christianity or even civilisation; nevertheless Commander Peary pleads earnestly that no endeavour should be made to interfere with them. "The suggestions," he says, "of some well-meaning persons that they be transported to a more hospitable region would, if carried out, cause their extermination in two or three generations. Our variable climate they could not endure, as they are keenly susceptible to pulmonary and bronchial affections. Our civilisation, too, would only soften and corrupt them, as their racial inheritance is one of physical hardship; while to our complex environment they could not adjust themselves without losing the very childlike qualities which constitute their chief virtues. To Christianise them would be quite impossible; but the cardinal graces of faith, hope, and charity they seem to have already, for without them they could never survive the six months' night and the many rigours of their home."

It is a commonplace that we learn most from our failures, and his failures in former attempts to reach the Pole had taught Commander Peary much, and had suggested to him many improvements in his equipment. One of the most important of these was what he calls the Peary sledge, which is from three to four feet longer than the Eskimo sledge, can carry a weight of ten to twelve hundred pounds on the level, and is pronounced the strongest and easiest running sledge in use for Arctic travelling. Its utility as compared with the Eskimo sledge was severely tested in the weary marches over the ice, and we read: "It had been a trying day for the sledges. The new Peary type, by reason of its shape and greater length, had come off best. Though two of these had suffered minor damages, none of them had been put out of commission. Two of the old Eskimo type had been smashed completely, and another nearly so." Commander Peary also invented or at least adapted a new design of alcohol stove, which was found to be quite serviceable during the expedition, and he invented an improved water-boiler, by the use of which an hour and a half of valuable time was saved every day.

He devotes an interesting chapter to what he calls "Essentials that brought success." Rejecting as erroneous the idea that the journey to the Pole was a rush or a dash, he claims for his expedition that it was from the outset deliberately and carefully arranged on the Peary system, which is the product of the experience of his six unsuccessful attempts to reach the Pole, and we may quote in his own words the main points of this system.

"To drive a ship through the ice to the farthest possible northern land base from which she can be driven back again the following year.

"To do enough hunting during the fall and winter to keep the party healthily supplied with fresh meat.

"To have dogs enough to allow for the loss of sixty per cent. of them by death or otherwise.

"To have the confidence of a large number of Eskimos, earned by square dealing and generous gifts in the past, so that they will follow the leader to any point he may specify.

"To have an intelligent and willing body of civilised assistants to lead the various divisions of Eskimos: men whose authority the Eskimos will accept when delegated by the leader.

"To have an ample supply of the best kind of sledges, to have a sufficient number of divisions or relay parties, each under the leadership of a competent assistant, to send back at appropriate and carefully calculated stages along the upward journey.

"To have every item of equipment of the quality best suited to the purpose, thoroughly tested, and of the lightest possible weight.

"To know, by long experience, the best way to cross wide leads of open water.

"To return by the same route followed on the upward march, using the beaten trail and the already constructed igloos to save the time and strength that would have been expended in constructing new igloos, and in trail breaking.

"To know exactly to what extent each man and dog may be worked without injury.

"To know the physical and mental capabilities of every assistant and Eskimo.

"Last, but not least, to have the absolute confidence of every member of the party, white, black, or brown, so that every order of the leader will be implicitly obeyed."

It may be said that one of the principal objects of this book is to show the success which attended the working of this system. It was essential to its success that every man engaged in it and everything used should be the best available: it would have been culpable folly and courting disaster to have again attempted to reach the Pole with inferior men or inferior implements, but this does not detract from the credit and admiration we unstintedly give to all who took part in so notable an achievement. And we cannot grudge to Commander Peary his personal gratification that the expedition was thoroughly American. He points out with obvious pleasure that "the *Roosevelt* was built of American timber in an American shipyard, engined by an American firm with American metal, and constructed on American designs. Even the most trivial items of supply were of American manufacture. As regards personnel almost the same can be said."

He showed excellent judgment in his selection of the subordinate members of the expedition, who, to a man, worked with him most loyally and heartily, a fact he is ever ready to acknowledge; and it must be a matter of legitimate satisfaction to him that he succeeded

in bringing all of them, with one exception, back to civilisation unharmed by their arduous labours. The only fatality in the expedition was the sorrowful death of Professor Marwin, the exact circumstances of which can only be conjectured as there were no eye-witnesses of it. There can be little doubt but that this immunity from death or even ill-health, in this as in Commander Peary's other expeditions, was greatly due to the minute and unwearied care and forethought with which he provided for the health, comfort, and safety of every one of his followers. A perusal of the narrative shows that the members of the party had to endure their full tale of hardships such as are incidental to, and indeed inseparable from, Arctic exploration, but on this occasion Commander Peary was favoured with some good luck. For example, on his way to the Pole, after leaving Cape Columbia, the open leads which he encountered were not nearly so formidable as those he had met with in former expeditions. They were the cause of delay to some extent, but that was practically the only result. Then for their return journey the Polar party were favoured with exceptionally good weather, so that with lightly burdened sledges, a wind in their favour, and a generally open trail in front of them, they covered in sixteen days the ground for which they had required thirty-seven days going. In these thirty-seven days they sledged over 413 geographical miles of solid ice, and ascertained for a certainty the important geographical fact that there is no land between Cape Columbia and the Pole. They took several soundings with the result of showing the existence of a continental shelf, the edge of which is about 46 miles north of Cape Columbia; after that they found no bottom. The march from Cape Columbia to the Pole was conducted strictly on the Peary system already described. If the reader will turn to the excellent map which accompanies the volume, he will easily understand how it was worked. The course and incidents of the famous march must be fresh in the memory of those who were present at Commander Peary's address in August, when he related them in the intensely graphic and vigorous language which we can expect only from one who took the principal part in the adventure, and on whose coolness, judgment, and fertility of resource hung the issues of success or failure. Those of our readers who were not present at the address we must refer to this volume, of which we may say generally, that, although somewhat egotistical (and probably necessarily so), it conveys to the reader a good impression of the personality of the author. It indicates many of the qualities we have known in Commander Peary for many years, his tenacity of purpose, his enthusiasm in his task which no defeat could diminish, his minute forethought and grasp of details, his skill in organisation and in the selection of his comrades, his unselfish care for others, and his generous sympathy and even affection for the Eskimos, his extraordinary power of inspiring confidence in his followers, his sturdy patriotism, his personal courage, his extraordinary powers of physical endurance, his fertility of resource, and calmness in danger; these and other qualities taken together constitute his unique qualification for the organisation and conduct of a successful expedition to the Pole. On the 6th April 1909 Commander Peary realised his dream by reaching the Pole. On the safe

The Expedition on the march in fine weather.

Photo. Capt. A.H. Rawson R.A., Portsm.

return of the Polar party to civilisation, the news of the brilliant achievement was received with the applause of the civilised world. Honours were showered on the Commander; and the Geographical Societies of both hemispheres vied with each other in their eagerness to demonstrate their admiration and appreciation of what he had done.

We have already alluded to the excellent map with which the volume is equipped; we have to add that there are also numerous illustrations of varying merit. The only part of the book, which is scarcely worthy of its place, is the "foreword" by Mr. Grosvenor of the National Geographical Society of Washington, which contains a sketchy and superficial account of former Arctic exploration.

PROCEEDINGS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

At a Meeting of Council held on Thursday, 10th November, the following ladies and gentlemen were elected Ordinary Members of the Society:—

Miss C. A. Johnston Stewart.
Miss Margaret N. Smith.
Mrs. Annie Scott Elliot.
Miss T. Hansen.
Mrs. Rae-Arnot.
Miss A. E. Wybrants.
Alfred Cecil Harrison.
James Steven.
Wm. Lorimer, junr.
G. F. Scott Elliot, M.A., B.Sc.
Wm. R. Smith.
John Thomson.
Robert A. Jamieson.
Wm. Monteith Pears.
Mrs. David Wilson.
Miss Helen S. Brebner.
Mrs. Morrison.
Miss Glendinning.
Miss Bannatyne.
Miss Jane Helen Wright.
John Davidson.
Alex. Wigton.
John Henry Bunting.
George M. Paul, LL.D.
Walter Elliot.
James M'K. Love.
John F. Ferguson.
Rev. George Walker.
George Jamieson Shepherd.
Miss Mary Angus.

The following were elected Teacher Associate Members:—

Miss J. B. More.
Miss Maggie Davidson.
Miss Margaret Henderson, M.A.
Miss Isa L. Muir.
Miss Mary Pollock.
Miss Marion M. Lamont.
Miss Georgina Knox.
Miss Mary Frew.
Miss Jessie H. Hepburn.
Miss Elizabeth C. Ligertwood.
Miss Barbara King.
Miss Emily A. Moyes.
Ernest F. F. Kaye, M.Sc.
Charles T. Macgregor, M.A.
Miss Alice Lochhead.
Miss Annie R. Nisbet.
Miss Isa C. Nisbet.
Miss E. Crome.
Miss Margt. Gilmour, M.A.
Miss Mary T. Pollock.
Miss Agnes W. Miller.
Miss Mary E. Edwards, M.A.
Miss Elsie A. Pearson, M.A.
Miss Ella J. Laidlaw.
Miss Octavia J. R. Bennett, M.A.
Alex. Fraser MacLean, M.A., B.Sc.
William Robertson.

Corresponding Member.

Dr. H. Karl W. Kumm, F.R.G.S., was appointed a Corresponding Member of the Society.

Diploma of Fellowship.

The Ordinary Diploma of Fellowship was conferred on John Matheson, a Member of the Society, subject to his compliance with the prescribed conditions.

Lectures in December.

Mrs. Gabrielle M. Vassal will address the Society in Edinburgh, Dundee, and Glasgow, on the 7th, 8th, and 9th December respectively. The title of her lecture will be "The Philippines."

Dr. Jean B. Charcot will lecture before the Edinburgh and Glasgow Centres on the 20th and 21st December. He will address the Society on "The Second French Antarctic Expedition," 1908-10.

The Rev. James Webster will address the Dundee and Aberdeen Centres on the 21st and 22nd December on "Manchuria Past and Present."

The Annual Business Meeting.

The Annual Business Meeting was held on Thursday, the 10th November, in the Society's Rooms, Synod Hall. Professor James Geikie, President of the Society, occupied the Chair at the beginning of the proceedings.

After the reading of the first two paragraphs of the Report of Council for the Twenty-sixth Session (see pp. 668-670), referring to the Royal Patronage and to the retirement of Professor Geikie from the Presidency, the list of Council and Office-bearers recommended by the Society for election was submitted to the meeting, and the Council and Office-bearers as recommended were unanimously elected. Thereupon the Right Hon. the Earl of Stair, the new President, took the Chair, and the remainder of the report was read by the Secretary.

In the new Council a new office was created, that of Chairman of Council, the first holder of which is Dr. J. Horne. Of the thirteen members retiring by rotation among the Edinburgh Members of Council, the following were re-elected:—Professor T. Hudson Beare, Mr. H. B. Finlay, Mr. Wm. B. Wilson, Sir James A. Russell, Dr. J. Horne, Mr. H. M. Cadell.

In accordance with the recommendation of Council to the effect that, inasmuch as the present Council is inconveniently large, no new Members should be elected for Edinburgh, unless on the ground of very special qualifications, the meeting determined to elect no new Edinburgh members on this occasion.

The following Members of the Society were elected to fill vacancies in the Council for Glasgow:—Mr. J. J. M'Lehose, Professor D. J. Medley, Dr. Robert S. Allan.

Dr. Paul Rottenburg was re-elected Chairman of the Glasgow Branch, and Dr. Robert S. Allan and Captain H. G. Lyons were elected Vice-Chairmen. Mr. R. B. Don was re-elected Chairman of the Dundee Centre, and Mr. G. M. Cook was elected Chairman of the Aberdeen Centre in place of Mr. William Smith resigned.

Mr. John W. Gourlay, C.A., was elected Local Secretary and Treasurer for Glasgow. The other Office-bearers of the Society were re-elected.

After the reading of the Report, Dr. W. S. Bruce asked whether the sug-

gestion made at the last Annual Business Meeting by Mr. C. E. Price, M.P., that the securities of the Society might be entered at their value at the date on which the balance was made up, instead of at the cost value, had been considered, and in reply Mr. P. A. Blair, the Treasurer, stated that it had not been considered desirable to alter the present practice, as the entering of the securities at their value at the date on which the balance was made up involves complicated entries on the side of Profit and Loss which have not the same significance in connection with a society such as this as they have in connection with a commercial undertaking, and that the practice that has hitherto been adopted by this Society is that which is uniformly followed by other societies of the same nature. He added that at the present time the value of the securities was about two hundred pounds in excess of their cost value. The adoption of the Report was moved by Mr. T. S. Muir and seconded by Colonel T. W. Jones, and the motion was unanimously adopted.

Before the meeting separated Dr. Horne said that they should not allow that meeting to close without expressing their high appreciation of the services which Professor Geikie had rendered to the Society. His name was a household word amongst geologists and geographers throughout the world. He had honoured the Society by accepting and by holding the office of President for the last six years, and he had been no mere figurehead. He had worked strenuously for the progress of the Society, with which he had been identified from its foundation. His leaving the Chair was an event of no small importance, and he thought they ought to express their highest appreciation and their gratitude for his great services.

Professor Geikie returned thanks. He was one of the founders of the Society, and he would be a very unnatural parent who did not look after the welfare of his offspring. He congratulated the Society upon the appointment of Lord Stair to the presidency. Lord Stair, they all knew, was a patriotic and representative Scotsman, and he felt sure that the welfare of the Society was safe in his hands.

Lord Stair acknowledged Professor Geikie's remarks, and the proceedings terminated.

GEOGRAPHICAL NOTES.

Europe.

The Condition of Corsica. We summarised here on page 267 an article by Professor Clerget on the social and economic condition of Corsica. Since there has appeared a Consular report (No. 4524) on the island, which adds some interesting details to those previously given. The author, Consul the Hon. Henry Dundas, points out that though the rivers are not navigable, yet they can be utilised for electric power, as they contain many falls. The lakes are numerous and deep, but are difficult of access. The largest, Lakes Nino and Creno, are said to contain many trout. The mountains are clothed with dense forests of oak, chestnut,

pines, beeches, etc., while the valleys are covered by the characteristic Mediterranean maquis or scrub. These valleys are mostly wide and fertile, forming extensive plains, but only about one-fifth of the surface is cultivated. Wheat is grown and exported, but only to be re-imported as flour, for there are not sufficient mills in the island. Other crops are oats, maize, beans, while the vine, olive, many citrus fruits, pomegranates, etc., are also extensively cultivated, though not on modern lines. Cattle are scarce, and the native horse is small, mules being largely employed for traction. There are about 300,000 sheep, 200,000 goats, and 100,000 pigs in the island. Railways are few, there being only a line between Ajaccio and Bastia (105 miles), with branches to Calvi and Chisonnaccia.

As regards trade with the United Kingdom, the exports are diminishing, while the imports, chiefly coal, are increasing slightly. The chief export is chestnut-wood extract for tanning, with smaller amounts of wine, fruit, and ores. As regards the total export trade, chestnut-wood extract, wood, charcoal, chestnuts, cheese, and wine, form the chief items. The chief industries carried on in the island are the manufacture of the chestnut-wood extract and the making of cheese. Unfortunately, in connection with the first, the forests have been recklessly exploited, and it is only within the last few years that new trees have been planted to replace those cut down. The cheese is largely made under the superintendence of firms from Roquefort, and is sent to Roquefort to mature. A local cheese is also made. The presence of the Roquefort firms has greatly stimulated sheep-breeding, and has led to a rise in price of the sheep. Their representatives remain in the island during the winter six months, and buy up the milk from the local farmers at a price of about 5½d. a gallon.

It is of interest to note that during 1909 a conference was held at Bastia on the best methods of attracting tourists to the island. As a result a new hotel is to be opened at Bastia at the end of the present year, while other small hotels of a modern type are to be built in picturesque parts of the island. A service of motor cars has also been established round Cape Corse.

The Soils of Russia.—At a conference on soils, held at Budapest in 1909, Professor Glinka read a paper on the various soils of Russia, which has some geographical importance. We quote the following from the account given in *Nature* of the paper, which has been published recently.

Professor Glinka recognises six main belts or zones, which run from north-west to south-east, and correspond generally to climatic and vegetation zones. The first is the Tundra zone, which is practically destitute of vegetation higher than mosses and lichens. The soils seem to be generally acid and are rich in partially decomposed organic matter (having thus a peaty character!). Next comes the Podzol zone, covered with forest, or in the lower lying regions with ponds and marshes. Here the soils consist of sand, loam or clay. They are white when dry, acid, poor in mineral plant food, but contain a considerable amount of organic

matter, and they are porous. In the case of the sands there is usually an underlying pan, while beneath the clays and loams there is a subsoil with much concretionary matter. This zone covers an enormous area in both Russia and Siberia. It is not much cultivated, the usual method being to clear away the forest over a particular area, cultivate the ground for a few years, and then leave it to run wild again, the agriculturist moving on to fresh ground. To the south, however, agriculture is more advanced, and a certain amount of humus has accumulated, together with reduction products, such as pyrites, marcasite, etc. Such soils are somewhat like moorland soils.

The next zone is the famous Black Earth zone, but between the two there is a transitional area, consisting of afforested steppes, where the original podzol soil has become modified. The Black Earth proper stretches from the Carpathians to the Ural Mountains, and thence across to Siberia; it covers Volhynia in the west and Perm in the east. Its characteristics are that a dark grey or black layer, rich in humus and granular in structure, overlies a layer rich in calcium carbonate. Except in the north there are no forests, and the greater part of the area is under cultivation, producing cereals. Further to the south the soil becomes chestnut-coloured, and is laminate instead of granular. Here the black humus layer is absent or thin, though calcium carbonate is still present in the subsoil. This is the dry steppe region, with a nomadic, pastoral population. The two remaining zones are partially desert regions, the more northern zone being brown, and the southern grey or white. These soils have not yet been much studied.

Report of the Ordnance Survey.—We have received the *Annual Report* of the progress of the Ordnance Survey for the past year. The following are the important points which it contains. The Cadastral Survey of England and Wales on the 1:2500 scale is undergoing a second general revision, and field work is in progress in Berkshire, Denbighshire, Flintshire, Lancashire, Sussex and Yorkshire. During the year, 3005 square miles of this revision were published.

The second general revision of the map on the scale of six inches to the mile is in progress, and 2162 square miles have been published during the year. The second revision of the maps on the scale of one inch to a mile is approaching completion, and the third revision has been commenced. The map on the scale of four miles to the inch is being revised as materials become available, and during the year, 31,761 miles were drawn, and 14,982 square miles engraved.

In Scotland the field-work for the second general revision of the Cadastral Survey on the 1:2500 scale is in progress in the counties of Lanark and Renfrew, and 631 miles of the map were published during the year. The publication of the first general revision of the six-inch maps is now complete, and 1876 square miles of the second general revision were published during the year. The second revision of the map on the scale of one inch to a mile is approaching completion.

As regards Ireland, the re survey of the Cadastral Survey on the 1:2500 scale is proceeding in the counties of Cavan, King's County, Meath, Sligo

and Westmeath. It has been completed in Antrim, Armagh, Clare, Carlow, Cork, Donegal, Down, Fermanagh, Galway, Kerry, Kildare, Kilkenny, Leitrim, Limerick, Londonderry, Louth, Mayo, Monaghan, Queen's County, Roscommon (southern half), Tipperary, Tyrone, Waterford, Wexford, and Wicklow. During the year, 1407 square miles have been surveyed and 1863 published. The second revision of the maps on the scale of one mile to the inch is proceeding steadily.

In regard to the arrangements for the sale of maps, the number of agents has been increased by ten during the past year, making the total 121 in England and Wales, 14 in Scotland, and 21 in Ireland. The gross value of the sales of the maps during the past year was £39,313, but, as nearly £10,000 of this total is due to sums received from the War Office, which prior to 1908-9 was supplied with maps free of charge, the net result is that there has been no increase in the amount of maps sold to the general public since 1904-5.

The sale of maps to schools at reduced rates shows a slight decrease during the past year, the figures being 55,012 maps for 1909-10 as compared with 58,622 during 1908-9.

Climate of Bergen.—We have received from the meteorological station at Bergen a pamphlet dealing with the rainfall at that place. The total fall is high, a thirty years' mean making it as high as eighty inches per annum, but there is great variation from year to year. As in Great Britain, the autumn is the wettest part of the year, October being the wettest month, and spring the driest, April, May and June having all an almost equally low rainfall. The wettest winds are those which blow from the south, and the driest the easterly and north-easterly ones.

Africa.

Lieut. Boyd Alexander's African Expedition.—It is announced that the French punitive expedition which recovered the body of the late Lieut. Boyd Alexander (cf. p. 375) was fortunate enough to find the diary of the explorer, which had been brought up to within a day of his death. This diary has been brought home by Lieut. Alexander's companion, the collector José Lopez, and fills up some blanks in the story as previously told. We described here the earlier phases of the journey, including the ascent of Kamerun Peak (see vol. xxv., p. 432) during an eruption. From here the expedition proceeded to explore the Manenguba Range, whence it struck northwards through almost unknown country by Kentu into Southern Nigeria, making collections the whole way, and eventually arriving at Ibi on the River Benue. Here the carriers were paid off, and Lieut. Alexander proceeded alone without an escort through dangerous country by way of Yola to Maifoni, while José Lopez went round by Kano in order to buy camels for the long desert journey across the continent.

At Yola Lieut. Alexander fell ill with blackwater fever, but made a marvellous recovery, and at the beginning of 1910 was ready to start

out on the last phase of his journey through Wadai and Darfur to Cairo. As already explained he met his death in the French Sudan in the early part of this year.

America.

The Ice Age and the Watershed of Patagonia.—In vol. ix. of the *Bulletin* of the Geological Institution of the University of Upsala, there appears a very interesting article by Mr. P. D. Quensel which offers an explanation of the peculiarities of the watershed in Patagonia. The article is well illustrated by maps and photos, and its main points may be summarised as follows:—

As is well known, the Patagonian Cordillera divides the southern part of the American continent into two parts, which differ strikingly from one another. To the west there is a fiord-landscape, with inlets and islands, narrow channels and perpendicular cliffs. To the east of the range there stretches the great plain of the Patagonian pampas, formed of recent and undisturbed beds, and sloping gently up to the mountains. Across this plain run deep and broad valleys, which, owing to the dry climate, carry very little water, and sometimes contain no river at all.

If one of these broad valleys be followed to the mountains, a very curious condition is noted. The broad valley is suddenly cut off from the mountains by a series of low morainic mounds, which constitute the watershed. Right and left of the obstacle the small tributary streams enter the valley, but above the morainic bar the continuation of the valley may be observed. Such moraines occur right along the sub-andine region, and the result is that the watershed at the present day does not lie in its normal position near the summit of the chain, but well to the east, where it is formed of relatively low hills of morainic origin.

In not a few cases the broad valley which lies to the west of the present low watershed opens into a large lake, lying in a depression of the chain, that is in what would be a pass if the lake were not present, and draining by a steep narrow gorge into the Pacific, *i.e.* to the west. At the present day the ice lies almost entirely to the west of the existing watershed.

Omitting the detailed descriptions given by the author we may summarise his explanation of this peculiarity in the following terms:—

During the time of maximum glaciation the ice-parting occupied the position of the pre-glacial watershed, and was somewhere near the centre of the range. The western glaciers had more erosive power than the eastern, on account of the nature of the mountains, and carved out deep gorges. The eastern glaciers, owing to the gentle slope, had little erosive power, and probably tended to fuse together on the low ground to form what is known as a piedmont glacier, *i.e.* a continuous sheet of ice. From the extremity of this sheet streams emerged which cut the broad valleys now seen in the pampas. As the eastern glaciers shrank and disappeared they left their terminal moraines

high up their valleys. The glaciers to the west, owing both to the greater precipitation and to the form of the land, lingered much longer than those to the east, so that the western drainage would be blocked by ice long after the eastern glaciers had dwindled into insignificance. The deep western valleys also would hold a greater depth of ice than the eastern.

The author next supposes that the western ice-barrier finally gave way, allowing the western streams to run with great rapidity down the narrow gorge-like valleys. The rapidity of these streams permitted them to capture a large part of the eastern drainage, aided doubtless by the glacial smoothing of the old watershed. Thus the glacial lakes in the old, pre-glacial passes were captured by the western streams, with the result that the level of the lakes was lowered, or in some cases they were completely drained. The low erosive power of the eastern streams made it impossible for them to cut through the moraines at the same rate as that at which the western streams were lowering the level of the summit lakes, and they thus lost all their head waters, and the watershed was shifted to the east.

General.

Prize Essays in Oceanography.—We have received an intimation to the effect that two prizes are to be offered for essays on either of the following subjects: -(1) The effects of wind, temperature, and salinity on the circulation of the ocean, (2) The question of continental connections; in connection with Dr. Bruce's class in Oceanography, held at the St. Andrews Summer School during the past summer. The essays are to be sent to the Director of Studies, 77 North Street, St. Andrews, by the last day of April, 1911, and the competition is only open to members of Dr. Bruce's class.

Photographs of Glacial Phenomena.—The *National Geographic Magazine* for June last contains two articles dealing with glacial phenomena, both of which are illustrated by some very fine photographs, and are worth special notice on this account. One of the two articles is on the Glaciers and Snowfields of British Columbia, and is written by Mr. Howard Palmer. It describes the results of two seasons' wanderings in the Southern Selkirks, the start being made from the Glacier station of the Canadian Pacific Railway. The glaciers and mountains specially studied included the Geikie glacier with the Illecillewaet névé above, Bishops Glacier and Deville névé, Black Glacier and Purity Range, Battle Range and Battle Glacier. Geikie Glacier is one of the finest in the Selkirk range. It reaches a length of two miles, descending to the low level of 4200 feet.

The other article, by Mr. O. J. Ljungstedt of the U.S. Geological Survey, is on erratic blocks, and is illustrated by some very remarkable photographs of erratic blocks occurring within the United States.

EDUCATIONAL.

From our list of New Maps in the present issue teachers will notice that we have received examples of the new Oxford Wall Maps, a valuable series in course of publication which should prove of great importance in the teaching of geography. The maps show the physical features, rainfall, and vegetation of the world and of each continent on a fairly large scale, and in addition there are world maps illustrating structure, thermal regions, pressure and winds, and the major natural regions. All the maps are drawn on equal area projections.

Those of the continents are on the same scale, 1 : 7,500,000, except in the case of Europe and Australasia. Most of Europe, however, appears on this scale either on the map of Asia or on that of Africa. Europe and Australasia are drawn to the scale of 1 : 5,000,000. The British Isles are drawn on a scale of 1 : 1,000,000. On each map the linear scale is given in miles and kilometres, and as a fraction of the real size. The superficial scale is added, the value of a square inch of the map being given in square miles, and the value of a square centimetre in square kilometres.

The equator, the tropics, latitudes 45° N. and S., and the polar circles are shown when they occur, and meridians 30° (or two hours) apart. As only a few lines of latitude and longitude are drawn, these do not spoil the appearance of the map, while they indicate the general trend of the parallels and meridians. The number of degrees of parallels and meridians 10° apart are shown in bold figures in the margin, in order that the pupil may associate certain parts of each map with their latitude and longitude.

The maps of physical features have, it is stated, been directly reduced from official maps where these exist, and compiled from the best data available where they do not. The contour intervals and the colour scheme are the same on all the 1 : 7,500,000 maps. This allows direct comparison between the maps of the different continents (excluding Australia). The contour intervals are drawn more closely than usual. This not only gives more information about the form of the land, but also has a graphic value, acting as a shading in the regions of steep slopes and so producing a clearer picture of relief. The values of the contour lines are given both in feet and metres. A large scale of colours with clearly marked figures is given. The ocean is coloured in shades of blue, the deepest parts being the darkest. The lowlands are white, instead of the commoner green, which spoils the appearance and gives so misleading an impression, and deepening shades of yellow and brown are used for increasing height above sea-level.

The maps are printed without names, for these are apt to obscure the main features, but a special series of maps of physical features with names has been prepared. This is a simplified reproduction of the unnamed physical feature map with fewer tints, on which names are inserted. Most of the names in the Oxford geographies are included. A series of political maps has been prepared in a similar way. The more important

states, boundaries, towns, and routes are prominently marked on a simplified physical feature map, while the less important names are in smaller lettering.

The temperature maps show both temperatures reduced to sea-level and also actual temperatures. The rainfall maps of the world also have smaller maps showing cloudiness and rainy seasons, and, as indicated, there are special rainfall maps for each continent.

It will be noted that all these special features render the maps particularly suitable for use in connection with geographical teaching which follows modern lines. We have been especially interested in the vegetation maps, for such maps have hitherto been very difficult to obtain. The specimen sent is that of North America, and seems to us perhaps to err on the side of too great complexity, for there are no less than eighteen colour tints, and to show a somewhat needlessly technical terminology, at least for school use. But as a whole the map is a very fine piece of work, and could be made the basis of a most interesting series of lessons. Of the two sheets of which it is composed, the northern is especially striking in its broad simplicity. We cordially recommend the whole series to the notice of teachers.

In vol. xxv. p. 43, we drew the attention of teachers to the lantern-slides supplied by the Diagram Company for school use. We have recently received a leaflet, copies of which are lying on the tables in the library, which describes a new departure. This consists in the establishment of a lending library of map and view slides for the use of teachers of geography. The slides in this library include 600 coloured map slides, and 2000 view slides, prepared on a new principle so as to be specially useful in teaching. For further details reference should be made to the leaflet, or application may be made direct to the Diagram Company, West Barnes Lane, New Malden, Surrey. Members of the Geographical Association are granted specially favourable terms for the hire of these slides.

NEW BOOKS.

EUROPE.

Highways and Byways in Buckinghamshire. By Clement Shorter. London: Macmillan and Co., Ltd., 1910. *Price* 6*s.*

Lord Beaconsfield, who was a Buckinghamshire squire, referred to it as "this great historical country." Certainly, the annals of Buckinghamshire are adorned with the names of many distinguished men. The poet Edmund Waller was born and died there. John Milton went to Chalfont in 1665 to escape the Plague, of which 14,000 people died in London. Thomas Gray composed his immortal Elegy in the churchyard of Stoke Poges and addressed an Ode to Eton College, which is also in the county. William Cowper lived for nineteen years at Olney and wrote there, with John Newton, his famous "Olney Hymns." So much for the Poets of Buckinghamshire. Its Patriots are equally celebrated. Mr. Shorter, who

dedicates his excellent book "to the immortal memory of John Hampden," who represented the county in parliament, says that Lord William Russell, whose tomb is at Chenies, "was pre-eminently the saint of the Revolution that triumphed with William of Orange, as Hampden was the saint of the Revolution that triumphed with the Commonwealth." Buckinghamshire has also been famous for Orators. Edmund Burke "laboured assiduously at his home at Gregories, alike as county gentleman, as statesman, and as philanthropist." He is buried in Beaconsfield Church. Benjamin Disraeli lived and died on his estate of Hughenden near High Wycombe. Oratory still distinguishes the county, for is not Mentmore Lord Rosebery's Buckinghamshire seat?

Lastly, the county has an abiding interest for Americans, for William Penn, the founder of Pennsylvania, lies interred at Jordans, which "has been called the Westminster Abbey of the Friends." Some Buckinghamshire seats have had a singular succession of occupants. Thus Bulstrode Manor once belonged to Whitelocke, keeper of the Great Seal under the Commonwealth, then to Judge Jeffreys of the Bloody Assize, then to Bentinck, Earl of Portland, the intimate friend of William of Orange, and then to the Duke of Portland who was twice Prime Minister of the United Kingdom. From the foregoing examples we see that the book is full of interest, which is enhanced by Mr. Griggs's artistic illustrations and a good map of the county, through which R. L. Stevenson walked, knapsack on back, in 1875, as described in his "Autumn Effect."

The Book of Arran. Archaeology. Edited by J. A. Balfour, F.R.Hist.S., F.S.A. Scot. The Arran Society of Glasgow. Glasgow: Hugh Hopkins, 1910. *Price* 21*s. net.*

This most interesting volume is the result of a complete archaeological survey of Arran made by the Arran Society of Glasgow. It is divided into four sections, of which the first, by Sir Archibald Geikie, gives a clear and concise account of the geology of Arran, and the other three discuss successively the Prehistoric, the Protohistoric, and the Historic periods, as revealed by the archaeological remains of the island. Of these periods, the first is the most interesting from our standpoint, and we propose to limit our review to a short account of Prof. T. H. Bryce's paper on the sepulchral remains of this period, as his paper gives a most instructive account of the early inhabitants of the British islands, a subject very inadequately discussed in most text-books.

Prof. Bryce notes that there is no definite evidence of the existence of Palaeolithic man in Scotland. Even for the earlier Neolithic period the evidence of his presence is scanty, consisting of some shell mounds in which implements occur. No skeletons of this period have been found, but he conjectures that this early race was of the long-headed, red-haired type known to exist elsewhere in north-western Europe in early Neolithic times.

Much more interesting, because of the more abundant remains, are the two races represented respectively by the chambered cairns and the short cists of Arran. The chambered cairns, the older of the two types, occur in the southern part of the island to the number of 17, of which 14 have been excavated, yielding rich remains. The book must be referred to for details, but we may note that these remains show that the builders used only stone implements, which were polished; they had domesticated animals; they sometimes practised inhumation and sometimes cremation; they made pottery with characteristic ornamentation. The skeletons show that they belong to the Iberian division of the Mediterranean race, that is, they were long-headed, probably brunette in colouring, and generally similar to the

builders of "Long Barrows" elsewhere. This race has left abundant traces over the whole of Ireland, in the western parts of England, where their barrows also extend through the Severn valley and northwards to Yorkshire and Derbyshire. In Scotland the chambered cairns occur only in the west, extending northwards to the Orkneys. These facts seem to indicate that the Iberian race entered the British area from north-western France, and swept northwards by the west coast, whose milder climate probably suited them better than the east.

The short cists of Arran, like the Round Barrows of England, contain the remains of a round-headed race whose members used bronze weapons and made ornaments of jet; they were obviously later in arriving than the Iberians. This race was certainly the same as that which still persists in many parts of Europe, and which, because it is largely found in elevated ground (as well as elsewhere), has been called Alpine. Very interesting is Prof. Bryce's account of the clash between the two types of culture, stone and bronze, and the two races, Iberian and Alpine, in the Clyde valley. Here, as also in some other parts of Europe, we find that the old stock, the Iberian, took over the culture of the immigrants, modified their own burial customs, learnt the use of metals, and so on, yet nevertheless the broad-headed and presumably conquering race disappeared, and has left little or no trace in later populations. The immigration of Scandinavian elements later has been similarly almost without effect upon the population of Arran, which remains of the Iberian type. But the persistence of this racial type is perhaps less remarkable than its power of absorbing alien cultures without loss of racial characteristics.

The British Isles in Pictures: A Geographical Reading Book. By H. Clive Barnard, M.A. London: Adam and Charles Black. *Price* 1*s.* 6*d.*

To say that this picture book is published by Messrs. Black is sufficient guarantee for the illustrations. Not only is the quality excellent, but the choice is so varied that they tell their story in a way which almost renders the text superfluous. Mr. Barnard, however, has written a very complete running commentary. The language is simple, and the chapters hang well together. There are one or two slips to which we may refer. Beer is not made from hops (page 36); the latter part of the first paragraph on coal (page 40) requires re-writing. It is not correct to say that "silk is not produced in the British Isles," and "adventure books" (page 53) is scarcely the term to apply to Scott's novels.

Cambridge County Geographies: Lanarkshire. By Frederick Mort, M.A., B.Sc., F.G.S., etc. Cambridge: At the University Press, 1910. *Price* 1s. 6*d.*

We have already noticed several volumes of this admirable series, but this is the first which refers to Scotland. Lanarkshire, as the wealthiest and most populous country, is given pride of place. Other volumes are promised, and we hope that the Cambridge University Press will receive sufficient encouragement to enable them to complete the set. As might be expected Mr. Mort has done his work excellently. The form of the book will be familiar to those who are acquainted with the previous volumes, and it could not be improved upon, but Mr. Mort's style is so clear and graceful, his treatment so exhaustive and well-proportioned that his work will certainly take a high place. The pupil who studies the wonderful development, commercial and industrial, which has taken place in little more than a century, or the roll of distinguished natives, the architecture, antiquities, or history, cannot fail to find many a reason for that local patriotism which before, perhaps, was merely a sentiment. We are certain, however, that the book will

not only be used in schools, but that it will be widely read elsewhere. To that much-abused person, the "general reader," it may be highly recommended.

Germany of the Germans. By ROBERT M. BERRY. London: Sir Isaac Pitman and Sons, 1910. *Price* 6*s. net.*

In the valuable series which the Messrs. Pitman are issuing on Countries and Peoples, the volume on Germany will worthily hold its own. The author has spent long years in the country, and familiarised himself with the life of the nation. He seems to omit no phase of German life, from that of the eager, versatile Emperor, learning and practising his trade of bookbinding, amid other imperial duties, to the thrifty peasant, eking out existence on a pittance. Between, the author deals with statesmen, writers and journalists, painters and musicians, the aristocrat and the student. The industries and the commerce, whose rapid expansion is making old Britain quite nervous; the pastimes and the sports, are succinctly dealt with. In a chapter on "A Generation ahead in Insurance," he describes the German scheme of old age pensions and insurance, so as to provide against sickness, accident and infirmity. In religious matters one learns with amazement that, while there is complete freedom of conscience and absolute toleration, various disabilities are thrown upon dissenters. No official position is allowed them. "They are not permitted to go through a religious marriage ceremony, nor to have their children baptized, and they are deprived of burial in consecrated ground." The barbarous duel system, which still curiously prevails in a land of such progress, is but lightly touched upon, but the brief paragraph in which this diabolic method of settling petty differences is described, shows the revolting character of the system and the tyranny which it exercises, especially over the German officer, who may detest it, yet must submit to its shame. Mr. Berry writes forcibly, packs much into little space, and presents the reader with a clearly defined picture of Germany of to-day. His work is illustrated with thirty full-page illustrations. It would certainly have been improved by having a map of the Fatherland.

Elementary Regional Geography: Great Britain and Ireland. By J. B. REYNOLDS, B.A., etc. London: Adam and Charles Black, 1910. *Price* 1*s.* 4*d.*

This is an excellent book for use in junior classes. As in the author's previous work the treatment is on modern lines kept well within bounds. The illustrations are numerous and well chosen, the maps clear and not over-loaded, the whole produced as Messrs. Black can produce books. As a Scottish Society we may regret that the author has not visited Edinburgh, otherwise the description of our city would have been more accurate. On page 59 the National *Portrait* Gallery, etc., should read National Gallery and Royal Institution. Nor is Holyrood Palace as yet "in ruins" (page 60), and Princes Street is not exactly on "the level land beneath the Castle Hill."

ASIA.

The Russian Road to China. By LINDON BATES, Junior. London: Constable and Co., Ltd. *Price* 10*s.* 6*d.*

This book is, in various ways, a remarkable performance. It is not, what the title might be taken to signify, merely a description of the great Siberian Railway.

although one chapter is devoted to the railway and the humours of a journey by it in winter; but the author deals on broad lines, and in a masterly fashion, with the story of the slow and gradual advance of the Slav across northern Asia, and of the turning of the tide of invasion of Europe by the Tartar hordes which dominated the situation for Russia from the thirteenth to the sixteenth century. In an eloquent passage, Mr. Bates relates how Russia, goaded into desperation, fought on, until, at last, the power of the Tartar was broken and the tyrant driven across the border. That Europe, as a whole, was spared this long trial, "she owes to the Russian. Through those crucial centuries when the Slav, weak, torn, anguished, beset with foes around and foes within, was standing grimly at the perilous portal of civilisation, Europe, within the temple, safe by his grace, was privileged to work up into light, to cement her nationalities, to effect the liberation of her masses, and to develop her intellect into the magnificent promise of a printing press, a people's Bible, and a Shakespeare." We quote this from the chapter on "Russia in Evolution" as a fair indication of the tone of Mr. Bates's work.

For him, unlike the ordinary traveller across Siberia to-day, the real journey began when he quitted the iron road at Irkutsk and pushed on by sledge and tarantass through Transbaikalia, and south across Mongolia, living by the way in the tents of the nomad Tartar tribes, and sharing their lives in a temperature of 40° below freezing-point. The route which he thus took follows the old caravan road, and, when the railway comes to be built from Kiakta to Kalgan and Peking, it will complete the real "Russian road to China." It will link up Europe to Far Cathay in a way that the present round-about route from Irkutsk to Vladivostock or Dalny, and thence by sea to China, cannot do; although the journey has already been so greatly shortened by the Trans-Siberian railway.

The reader gets a glimpse of the inwardness of social life in the Siberian stations and the impact on their inhabitants of the power that exists behind the throne in St. Petersburg. It is of interest to notice the difference between the Russian and the British methods of treatment of the peoples who are described as "subject-races." The Buriats of Transbaikalia grow up side by side with the members of the Slav village communes. Russia can lay a heavy and remorseless hand upon any movement for political freedom. But, apart from this, the official attitude is one of easy-going *laissez faire*. "It is no small thing, this which Russian rule has done for the Buriats. A people whom any other nation would spurn in racial ostracism, perhaps would eliminate, live side by side with the good-natured Slav in perfect accord, progressing in civilisation and material wellbeing as high as the individual can aspire to and attain."

We have vivid pictures of tent life among the Mongols, and of Urga, the city of the venal and voluptuous Grand Lama, whom the people adore as the incarnate Buddha.

Mr. Bates emphasises the factor of the commercial value of the existing railway line running through the habitable lands which lie between parallels 55 and 58·30° N., and crossing the courses of the rivers Tobol, Irtish, Obi, Tom, Yenesi, and Angara, which themselves reach far up into the agricultural zone on the north side of the railway. Although it may bring in no direct return for the millions which have been sunk, the author points out that the line is an empire-builder as important as has been the Nile to Egypt, or the Mississippi to America.

In conclusion, we would notice the author's reference to the revolutionary spirit which seems to be strong among a section of the Russian inhabitants of Siberia, and to the uprising of 1905, whose history is to be gleaned only from the lips of cautious witnesses. The book is well worthy of perusal by all who are interested in things Russian.

AFRICA.

Glimpses of East Africa and Zanzibar. By Ethel Younghusband. Fifty-eight Illustrations from Photographs and Map. London: John Long, Limited, 1910. *Price* 12*s.* 6*d. net.*

When Mrs. Younghusband was going to British East Africa she found great difficulty in getting information about the conditions of life there, and her book is intended to give such information to others who may follow her. At the same time she insists on the rapidity of changes in this rapidly developing country. The book is useful as well as bright and readable, full of the incidents of life in and about Nairobi, and should enable ladies who contemplate residence there to judge whether or not they are suited to the life. Still it is not every one of them who will be called upon, as Mrs. Younghusband was, to help in cutting up a leopard in the hope of recovering a friend's cat. The writer's husband was a captain in the 1st King's African Rifles, and she gives a capital account of hunting expeditions with him. Later he was stationed at Zanzibar, and we have a historical and descriptive sketch of the island. Mrs. Younghusband seems to have been admirably adapted for her position, and thoroughly appreciated the people she met.

AMERICA.

The Picturesque St. Lawrence. By Clifton Johnson. Picturesque River Series. New York: The Macmillan Company, 1910. *Price* 5*s. net.*

In the interesting series of volumes on Picturesque Rivers, Messrs. Macmillan have been fortunate in obtaining a writer for the St. Lawrence of the culture and capacity of Mr. Clifton Johnston. He bears you along the noble waterway of Canada, all the while busily chatting in a most interesting fashion, describing the scenery or relating romantic and exciting incidents that occurred on the passing banks. This makes the river live before you. The cities *en route*, such as Montreal, Quebec, etc., have the circumstance of their founding and early history vividly told, and this is followed by a bright walk through the streets to enable the reader to understand their manner and mood to-day. The Thousand Islands and the Rapids are well portrayed, the charm and delight of the one, the wonder and excitement of the other. We have the St. Lawrence as traversed both in summer and winter, with many a strange story of the Indians that were wont to roam along its banks, and their conflicts with the early settlers, French and British. You feel at the end of the book as if you had verily "done" the river, and are prepared to say with your well-informed and enthusiastic guide, "Certainly the St. Lawrence is one of the noblest and most interesting of our great waterways, and a visit to it is well repaid in either summer or winter. Best of all, see it at both seasons, for only so can you feel that you have a thorough knowledge of its charms." The book is profusely illustrated, but a map would have enhanced its interest.

AUSTRALASIA.

The Melanesians of British New Guinea. By C. G. Seligmann, M.D. Cambridge: At the University Press, 1910. *Price* 21*s. net.*

We gather from the preface of this remarkable book that it embodies the observations made by Dr. Seligmann when on the Daniel's Ethnographical Expedition to New Guinea in 1904, supplemented by additional notes, collected when he was engaged on the Cambridge Anthropological Expedition to Torres Straits in 1898. Although its title might indicate that it deals with all the Melanesians of

New Guinea, we are informed at once that it does not deal with the Papuans, the original inhabitants, but is mainly concerned with the immigrant tribes, which Dr. Seligmann divides into two groups and designates Western Papuo-Melanesians and Massim or Eastern Papuo-Melanesians. To them he devotes a portly volume of nearly 750 pages, full of patient research and carefully elicited details, and yet he tells us that his investigations are incomplete. "It was impossible," he says, "in the time at my disposal to make a lengthy investigation of the customs and habits of all the tribes of the great division (the Western Papuo-Melanesians) with which I came in contact. I therefore resolved to select one of the tribes possessing a single form of chieftainship and clan-system, and to endeavour to obtain an outline, not only of the social organisation of this tribe, but of all its more important habits and customs, and then to do as much work as possible on the variations in the social system of other tribes amongst whom I knew there was a comparatively complicated organisation of the clans and a highly developed system of chieftainship. Circumstances prevented my carrying out this plan as fully as I had intended, and I am unable to give an account of the social system of a number of tribes of which the Aroma and Mailu must be taken as types, but some of the essential social characteristics of these tribes have been mentioned in the introduction." Remembering this limitation, which also applies to the treatment of the Massim or Eastern Papuo-Melanesian tribes, we may state at once that the work is of quite exceptional value and interest to the ethnographer and anthropologist. It is a model of careful and patient research, in which the writer has solicited and received useful assistance of all sorts from authorities on the spot, *e.g.* officials, missionaries, native chiefs, etc. The peoples described are still in almost as primitive conditions as they were some centuries ago. The contact with missionaries and traders however has begun to have its usual disintegrating effect, and so, if it was expedient that an accurate and detailed record of these beliefs, customs, laws, habits, institutions, etc., should be made, there was no time to be lost, and herein consists the intrinsic and exceptional value of Dr. Seligmann's work, that we have at first hand a detailed record of facts regarding these primitive peoples, which some years hence could probably not be produced. It is impossible to exaggerate the patience, skill, and assiduity with which this enormous mass of material regarding a number of savage tribes has been elicited, compared, correlated, classified, and rendered available for future use. Dr. Seligmann, however, expressly disclaims complete accuracy for his investigations, and explains that his facilities for work varied greatly in different localities. But the net result has been an important and valuable contribution to our knowledge of ethnography and anthropology, for which students of these sciences will be sincerely grateful. The book is embellished with many excellent photographic illustrations and with a useful map.

Through Tropic Seas. By Frank Burnett. London: F. Griffiths, 1910. *Price 7s. 6d. net.*

The author of this interesting and vivacious narrative is a Scotsman who sailed with his wife and family (date not given) in a small schooner from Vancouver to Honolulu, which they reached after thirty-eight and a half tempestuous days. They then sailed twelve hundred miles further to Fanning Island (British), where several northern species of duck make their winter home, their flight thither having been over four thousand miles. The author next proceeded eight hundred miles further to Tongareve (Penrhyn), a dependency of New Zealand, where the pearl fishing produces annually some £24,000, the shell being obtained by male and

female divers. Mr. Burnett considers that the Christianity of the South Sea Islanders is of the most superficial character. The people are steeped in hypocrisy and are absolutely unreliable ; while the women are devoid of all morality according to our standard. At the same time the natives are most bigoted Sabbatarians, and the author had to draw water on Sunday himself.

After visiting Christmas and Washington Islands, the Gilbert Islands (also British) were reached, and the author describes their natives as "absolutely wanting in gratitude." Still they are "honest, brave, liberal and charitable, especially to their relatives." Their food consists almost exclusively of cocoanuts and fish. Although there are no land birds there, waders and seabirds abound, while enormous sharks are caught and their fins are sent to China, where they are accounted a great delicacy.

The author reminds us that the various archipelagoes of the South Pacific are believed to have been discovered not by the Polynesians but by an altogether different race which inhabited them previously for many centuries. This fierce and warlike race, whose massive ruins and sculptures attest a higher civilisation, has completely vanished and has been succeeded by wild Polynesians or savage Papuans, and its disappearance forms "the mystery of the Pacific."

Mr. Burnett describes the dreadful state of affairs existing in the Gilbert Islands before the British protectorate was proclaimed in 1892, and shows how enormously the natives have benefited both as regards their lives and property. After discussing the Fiji group, which were inhabited by cannibals until the islands passed under British control in 1873, the author devotes a chapter to "The Missionary Question," beginning with the first missionary ship *Duff* which was sent to the South Seas by the London Missionary Society in 1796.

The author declares that modern missionaries have fallen far short of those originally sent, and that their insistence on the natives being clothed has "led to the disastrous decrease in population in most of the groups, in some cases to at least fifty per cent. of what it was when they were discovered. This is the opinion of most medical investigators." He explains that the bodies of the naked natives, being saturated with cocoanut oil, shed water like a duck's back, whereas the often-drenched clothes the natives now wear have given them phthisis, a disease formerly unknown, and has increased the death-rate to an appalling extent. The author accuses the missionaries labouring throughout Polynesia at the present day of intolerance, want of charity, and an "overwhelming anxiety to obtain as much as possible of the world's wealth," and declares that Christian sects there "fought and quarrelled amongst themselves through buying converts, one from the other, with tobacco." His book is largely illustrated and contains good pictures of South Sea islanders.

GENERAL.

Tillers of the Soil. By MARION I. NEWBIGIN, D.Sc. (Lond.) London: Macmillan and Co., Ltd., 1910. *Price* 1*s.* 6*d.*

This is one of a series entitled "Readable Books in Natural Knowledge" with reference to which the publishers in a prefatory note say that the object of the series is to supplement the systematic study of science in schools based on personal observation and experiment with books furnishing broad views of scientific thought and purpose, fitted to exalt the scientific spirit which leads men to devote their lives to the advancement of natural knowledge and to show how the human race ultimately reaps the benefit of such research. All these aims this little book fulfils admirably. Well arranged, it gives in a series of short chapters

a survey of agricultural industry from the most primitive to the most advanced conditions, in language which will never repel the young either by its difficulty or by its condescending simplicity. In doing so it is constantly dealing with facts and ideas of universal and perennial interest which ought to be familiar to all well-educated people, but are not. No school library should be without it, and few books of its size are likely to furnish so many narratives and descriptions fitted to make things geographical attractive. The present reviewer, it may be added, was carried on by the mere interest of the work from the first page to the last.

The Junior Geography. Book I.—The British Isles. By Ellis W. Heaton, B.Sc., F.G.S., author of *A Scientific Geography.* London: Ralph, Holland and Co. n.d. *Price* 1*s. net.*

Mr. Heaton has "reduced" his larger book into one for use in the junior classes, but he has introduced several new features. The idea of special local maps and a summary of local geography to be studied and amplified by pupils for their own districts is a good one. We confess, however, to a possibly old-fashioned prejudice for the treatment of the United Kingdom by its political divisions. And we hope that Mr. Heaton will abandon the abominable spelling of Edinboro' for Edinburgh. Let us add a word of commendation for the railway maps, of which there is one for each system. The treatment of climate is also very sound.

L'Epoca delle Grandi Scoperte Geografiche. By Carlo Errera. Seconda edizione rinnovata ed accresciuta con 22 carte, schizzi e ritratti. Milano: Ulrico Hoepli, 1910. *Prezzo, lire* 6.50.

On page 503 of vol. xviii. we reviewed here the first edition of this useful book. The author has taken advantage of the new issue to introduce various minor modifications, both as regards plates and text, though the general plan remains the same. A useful addition is a classified bibliography, which takes the place of the short list of authorities in the first edition. The book brings the story of the exploration of the globe down to Magellan's voyage of circumnavigation, and may be cordially recommended as giving an interesting and instructive account of the period of the great discoveries.

A Laboratory Manual of Physical Geography. By Professor R. S. Tarr and O. D. von Engeln of the Department of Physical Geography at Cornell University. New York: The Macmillan Company, 1910. No price stated.

This manual is intended "for use in connection with a general course in Physical Geography in high and secondary schools and in colleges." It consists of 362 pages of questions beginning with the form of the earth and ending with Magnetism. The authors claim to have succeeded in constructing a logically connected course. The claim may be admitted on the whole, but it is difficult to perceive the sequence of the last two sections, entitled respectively "Life Zones on the Earth" and "Magnetism." A new feature is the leaving of space after the questions for answers, so that the student really writes his own text-book, and the pages being detachable, he can preserve it section by section for easy reference. The work is, of course, for American use only, but we have no doubt that a British edition would be deserving of success. We particularly commend the portions dealing with the study of the weather.

The Advanced Class Book of Modern Geography: Physical, Political, Commercial. By WILLIAM HUGHES, F.R.G.S., late Professor of Geography in King's College, London. New and Revised Edition. London: George Philip and Son, 1910. *Price* 4*s.* 6*d.*

This is a new and revised edition of Professor Hughes's well-known text-book, which is adapted for use by teachers of the highest class at schools and by advanced students. There is no doubt as to the exhaustiveness and general accuracy of the work, and it cannot be too highly recommended as a compendium of geography. We have been able to detect only a very few small slips, and these any teacher will see at once, but we must protest against the treatment of the Alps which seems common to nearly all text-books. It would appear that to write correctly about the Alps one must have mountaineering experience among them. On page 226 we find "Mont Blanc (the culminating point of the Alps, and also the loftiest mountain in Europe), 15,780 feet, within the French border; Mont Pelvoux, 13,400 feet; Mont Viso, and Mont Genèvre, and other Alpine heights on the frontier line of France and Italy."

Now Mont Blanc is the highest mountain in the Alps, but not in Europe. Even allowing for the fact that the Caucasus range forms a natural boundary in that region between Europe and Asia (although it is not the political boundary), still Mount Elbruz is wholly on the northern side of the water-parting, and is therefore as much in Europe as Mont Blanc is. Further, the frontier runs very close to the summit of Mont Blanc, so that nearly half of the mountain on the south-eastern side is in Italy. Mont Pelvoux is in the Dauphiné Alps, and several miles on the French side of the border; Monte not Mont Viso is wholly in Italy, and Mont Genèvre is not a mountain at all, but a pass. It seems absurd to mention here that the word "Mont" or "Monte" was applied to passes long before the peaks themselves received separate names; *e.g.* Mont Cenis, Monte Moro, Mont St. Gothard.

BOOKS RECEIVED.

The Guide to South Africa for the use of Tourists, Sportsmen, Invalids and Settlers. With Coloured Maps, Plans, and Diagrams. Edited annually by A. SAMLER BROWN and G. GORDON BROWN. 1910-1911 edition. Eighteenth edition. *Price* 2*s.* 6*d.* London: Sampson Low, Marston and Co., Ltd., 1910.

Cumberland (Cambridge County Geographies). By J. E. MARR, F.R.S. With Maps, Diagrams and Illustrations. Cr. 8vo. Pp. xii + 169. *Price* 1*s.* 6*d.* Cambridge: University Press, 1910.

Unfrequented France by River, Mead and Town. By Miss BETHAM-EDWARDS. Illustrated by Original and Copyright Photographs. Demy 8vo. Pp. x + 204. *Price* 10*s.* 6*d. net.* London: Chapman and Hall, Ltd., 1910.

Nach Schottland, Island und Norwegen. Von Dr. M. WEISS. Cr. 8vo. Pp. viii + 186. *Preis Mk.* 3. Berlin: Dietrich Reimer, 1910.

La Conquête du Sahara. Essai de psychologie politique. Par E. F. GAUTIER. Cr. 8vo. Pp. 259. *Prix* 3 *fr.* 50. Paris: Librairie Armand Colin, 1910.

Handbook of South Australia. By DAVID J. GORDON. Issued by the Government of South Australia. With over 280 Illustrations. Royal 8vo. Pp. 344. Adelaide: C. E. Bristow, 1908.

Record of the Mines of South Australia. Fourth edition. By H. Y. L. Brown, F.G.S. Demy 8vo. Pp. 382. Adelaide: C. E. Bristow, 1908.

The Broad Stone of Empire: Problems of Crown Colony Administration, with Records of Personal Experience. By Sir Charles Bruce, G.C.M.G. 2 vols. With maps. Demy 8vo. Vol. I. pp. xxxiv + 511. Vol. II. pp. viii + 555. *Price* 30*s. net.* London: Macmillan and Co., Ltd., 1910.

Highways and Byways in Cambridge and Ely. By the Rev. Edward Conybeare. With Illustrations by Frederick L. Griggs. Cr. 8vo. Pp. xviii + 439. *Price* 6*s.* London: Macmillan and Co., Ltd., 1910.

Venice in the Thirteenth and Fourteenth Centuries. A Sketch of Venetian History from the Conquest of Constantinople to the Accession of Michele Steno, A.D. 1204-1400. By F. C. Hodgson, M.A. Demy 8vo. Pp. xvi + 648. *Price* 10*s.* 6*d. net.* London: George Allen and Sons, 1910.

In the Rhône Country. By Rose G. Kingsley, Officier de l'Instruction Publique. With 67 Illustrations. Demy 8vo. Pp. x + 307. *Price* 10*s.* 6*d. net.* London: George Allen and Sons, 1910.

Canoeing and Camping Adventures: Being an account of Three Cruises in Northern Waters. By R. C. Anderson, F.R.G.S. Illustrated with Pen and Ink Sketches by G. C. Boulderson and with Maps and Plans by the Author. Cr. 8vo. Pp. x + 192. *Price* 3*s.* 6*d. net.* London: C. Gilbert-Wood, 1910.

Voyage en Automobile dans la Hongrie Pittoresque. Par Pierre Magre. Préface de M. Edouard Herriot. Deuxième édition. Cr. 8vo. Pp. xx + 285. *Prix* 3 *fr.* 50. Paris: Librairie Plon-Nourrit et Cie, 1910.

Biskra. Sidi-okba and the Desert. A Practical handbook for Travellers. By Joseph C. Hyam. Profusely Illustrated by Full-page Engravings and Numerous Illustrations in the Text. Also one Coloured Plate and two Maps. First edition. Cr. 8vo. Pp. ix + 102. Algiers: Hyam and Co., 1910.

The Old North Trail; or Life, Legends, and Religion of the Blackfoot Indians. By Walter M'Clintock. Demy 8vo. Pp. xxvi + 539. *Price* 15*s. net.* London: Macmillan and Co., Ltd.

The Book of Buchan. A Scientific Treatise, in six sections, on the Natural History of Buchan, Prehistoric Man in Aberdeenshire, and the History of the North-East in Ancient, Mediæval and Modern Times, by Twenty-nine Contributors. Edited and arranged by J. F. Tocher, B.Sc. 4to. Pp. xxi + 507. Peterhead: The Buchan Club, 1910.

Fifeshire (Cambridge County Geographies). By Easton S. Valentine, M.A. With Maps, Diagrams and Illustrations. Cr. 8vo. Pp. ix + 188. *Price* 1*s.* 6*d.* Cambridge: University Press, 1910.

Eastern Pacific Islands. Tahiti and the Marquesas Islands. By F. W. Christian. With Sixty-four Illustrations. Demy 8vo. Pp. 269. *Price* 7*s.* 6*d. net.* London: Robert Scott, 1910.

Bohemia and the Čechs. The History, People, Institutions, and the Geography of the kingdom, together with accounts of Moravia and Silesia. By William S. Monroe. Illustrated. Cr. 8vo. Pp. xxiv + 488. *Price* 7*s.* 6*d. net.* London: G. Bell and Sons, 1910.

General and Regional Geography for Students. By J. F. Unstead, M.A., and E. G. R. Taylor, B.Sc. Demy 8vo. Pp. xii + 516. *Price* 6*s.* London: George Philip and Son, Ltd., 1910.

The Incas of Peru. By Sir Clements Markham, K.C.B., D.Sc. (Camb.), F.R.S., F.R.G.S., F.S.A. With Sixteen Illustrations and a Map. Demy 8vo. Pp. xvi + 443. *Price* 10*s.* 6*d. net.* London: Smith, Elder and Co., 1910.

Home Life in Hellas: Greece and the Greeks. By Z. Duckett Ferriman.

Illustrated. Demy 8vo. Pp. 338. *Price* 8*s. net.* London: Mills and Boon, Ltd., 1910.

Things seen in Spain. By C. Gasquoine Hartley. With fifty Illustrations. 16mo. Pp. 253. *Price* 2*s. net.* London: Seeley and Co., Ltd., 1911.

The Theory of Map-Projections, with Special Reference to the Projections used in the Survey Department. By J. I. Craig, M.A., F.R.S.E. Royal 8vo. Pp. iv + 80. *Price* 4*s.* Ministry of Finance, Egypt, 1910.

The United States of Brazil, with a Chapter on the Republic of Uruguay. By Charles W. Domville-Fife. Illustrated. Demy 8vo. Pp. xxiii + 249. *Price* 12*s.* 6*d. net.* London: Francis Griffith, 1910.

The North Pole. By Robert E. Peary. With an introduction by Theodore Roosevelt. One hundred and sixteen Illustrations from Photographs. 4to. Pp. xii + 326. *Price* 25*s. net.* London: Hodder and Stoughton, 1910.

La Vie Politique Orientale en 1909. Par Dr. Georges Samné and Y. M. Goblet. Demy 8vo. Pp. xi + 317. *Prix* 6 *francs.* Paris: Editions de la "Correspondance d'Orient," 1910.

From Irish Castles to French Châteaux. By Norma Bright Carson. Illustrated from Photographs by the Author and others. Cr. 8vo. Pp. xi + 242. London: T. Werner Laurie, 1910.

Chota Nagpore: A little-known Province of the Empire. By E. H. Bradley Birt, I.C.S., F.R.G.S. With an introduction by the Right Hon. The Earl of Northbrook, G.C.S.I., sometime Viceroy of India. With forty-two Illustrations and a Map. Second edition (enlarged and revised). Demy 8vo. Pp. xviii + 327. *Price* 12*s.* 6*d. net.* London: Smith, Elder, and Co., 1910.

The Holy Land. By Robert Hichens. Illustrated by Jules Guérin and with Photographs. 4to. Pp. x + 302. *Price* 25*s. net.* London: Hodder and Stoughton, 1910.

In the Heart of Africa. By The Duke Adolphus Frederick of Mecklenburgh. Translated by G. E. Maberly Oppler. With Maps and numerous Illustrations. 4to. Pp. xx + 295. *Price* 15*s. net.* London: Cassell and Co., Ltd., 1910.

The Island of Stone Money: Uap of the Carolines. By William Henry Furness, third M.D., F.R.G.S. With Illustrations from Photographs by the Author. Demy 8vo. Pp. 279. *Price* 15*s. net.* London: J. B. Lippincott Co., 1910.

List of Documents in Spanish Archives relating to the History of the United States, which have been printed or of which Transcripts are preserved in American Libraries. By James Alexander Robertson. Cr. 4to. Pp. xv + 368. Washington, D.C.: Carnegie Institution, 1910. [Presented by Prof. Geikie.

Weather Instruments and how to use them. By D. W. Horner, F.R.Met.Soc. With Illustrations from Photographs. Pp. 44. *Price* 6*d. net.* London: Witherby and Co., 1910.

Greek Lands and the Greek People. By J. L. Myres. Pp. 32. *Price* 1*s.* 6*d. net.* Oxford: Clarendon Press, 1910.

Diplomatic and Consular Reports.—Trade of Dairen, 1909 (4504); Trade and Agriculture of Bavaria, 1909 and Part of 1910 (4565); Trade of Berlin, 1909 (4566); Trade and Agriculture of Poland and Grodno, 1909 (4567); Trade of Buenos Ayres, 1909 (4568); Trade of Paraguay, 1909 (4569); Trade of Panama 1909, (4571); Trade, etc., of Frankfort for the year April 1909 to April 1910 (4570); Trade and Navigation of Kobe, 1909 (4573); Trade of Wenchow, 1909 (4578); Trade of Salonica, 1909 (4578); Trade of Bilbao, 1909 (4572); Report on

the Russian Budget, 1909 (4574) ; Trade and Commerce of Fiume, 1909 (4576) ; Trade and Commerce of St. Pierre and Miquelon, 1909 (4577) ; Trade, Commerce, and Agriculture of Surinam, Dutch Guiana, 1909 (4580) ; Trade of Casablanca, 1909 (4581) ; Trade and Commerce of Riga, 1909 (4582) ; Trade of Malaga, 1909 (4583) ; Report on the Geographical Conditions, Commerce, and Natural Resources of the Republic of Bolivia, (4584) ; Trade of Quezaltenango, 1909 (4585) ; Foreign Trade of Servia, 1909 (4586) ; Trade of Seistan and Kain, 1909-10 (4587) ; Trade of Foochow, 1909 (4588) ; Trade of Monthons, of Nakon, Snitamarat and Patant, 1909 (4589) ; Trade of Brazil, 1909 (4575) ; General Trade and Commerce of French Guiana, 1909 (4591) ; Trade of Shanghai, 1909 (4592) ; Trade and Commerce of Arabistan, 1910 (4594) ; Trade and Commerce of Portuguese Guinea, (4595) ; Trade and Commerce of French Indo-China, 1909 (4596) ; Trade, etc., of Franch, 1909-10 (4597).

Colonial Reports (Annual).—Gold Coast Report for 1909 (654) ; Nyasaland Report for 1909-1910 (655) ; Report on the Work of the Imperial Institute, 1909 (656) ; Fiji Report for 1909 (657) ; Grenada Report for 1909 (658).

Colonial Reports (Miscellaneous).—Report on the Results of the Mineral Survey of Ceylon, 1906-7 and 1907-8 (74).

Publishers forwarding books for review will greatly oblige by marking the **price** *in clear figures, especially in the case of foreign books.*

NEW MAPS.

EUROPE.

ORDNANCE SURVEY OF SCOTLAND.—The following publications were issued from 1st to 30th September 1910 :—

One-inch and Smaller Scale Maps.—One inch-map (third edition), printed in colours and folded in cover, or flat in sheets. *Glenelg.*—Sheet 71. *Portree.*—Sheet 80. *Fraserburgh.*—Sheet 97. Price—on paper 1s. 6d. ; mounted on linen 2s. ; mounted in sections 2s. 6d each.

Six-inch and Larger Scale Maps.—Six-inch Maps (Revised), quarter sheets, with contours in blue. Price 1s. each. *Ayrshire.*—23 SE. ; 34 NE. ; 36 SW. With contours in black. Price 1s. each. *Ayrshire.*—39 SW. ; 47 NE. ; 48 NW. ; 49 SE. ; 51 NW. ; 56 NW. ; 57 NW. ; 71 NE.

1 : 2500 Scale Maps (Revised), with houses stippled, and with areas. Price 3s. each. *Lanarkshire.*—Sheets XLII. 11, 12, 15, 16 ; XLIII. 5, 6, 13 ; XLVI. 1, 2, 3, 4, 5, 6, 7, 8 ; XLVII. 1, 2, 5, 6, 10, 13, 14 ; XLIX. 7 ; L. 1. Sheet XXXIV. (11 and 15). Price 1s. 6d.

Sheets too open for publication on 1 : 2500 Scale. *Ayrshire.*—Sheets VII. 5 ; XXIV. 11, 15 ; XXV. 12 ; XXVI. 9 ; XXVII. 5 ; XXXI. 9 ; XXXVI. 7, 15 ; XL. 8 ; XLII. 3, 4, 15 ; XLVI. 9, 14 ; XLVII. 8, 13 ; XLVIII. 5 ; LI. 7, 10, 11, 13 ; LII. 5 ; LVI. 14 ; LVII. 9, 11 ; (LXI. 2, and LV. 14) ; LXI. 8, 11 ; LXVI. 12 ; LXVII. 9, 13. Several portions of this County are published on 6-inch Scale only. *Lanarkshire.*—Sheets XXII. 12 ; XXIX 3.

The following publications were issued from 1st to 31st October 1910 :—

One-inch and Smaller Scale Maps.—One-inch Map (third edition), engraved, with hills in brown or black. Sheet 86. Price 1s. 6d. (Third edition.) Printed in colours and folded in cover, or flat in sheets. *Peterhead.*—Sheet 87. Price—on paper 1s. 6d. ; mounted on linen 2s. ; mounted in sections 2s. 6d.

Six-inch and Larger Scale Maps.—Six-inch Maps (Revised), quarter sheets, with contours in blue. Price 1s. each. *Ayrshire.*—19 NW. ; 22 SE. ; 23 SW. ; 28 SE. ; 34 SE.

1 : 2500 Scale Maps (Revised), with Houses stippled, and with Areas. Price 3s. each. *Lanarkshire.*—Sheets XXXIV. 6, 10, 14 ; XXXVII. 11, 12, 16 ; XXXVIII. 9, 14 ; XLI. 3, 4, 7, 8 ; XLII. 1 ; XLIII. 9. Sheet XL. Grand 2. Price 1s. 6d.

Note.—There is no coloured edition of these Sheets, and the unrevised impressions have been withdrawn from sale.

FRANCE. Bartholomew's Contour Motoring Map of France and portions of Adjoining Countries, showing all the Principal Roads, with heights and distances in metres and kilometres. In two sheets. Scale 1 : 1,000,000, or 16 English miles to an inch. 1910. Price two sheets, mounted on cloth, dissected, and in case, 10s. 6d. *John Bartholomew and Co., Edinburgh.*

This map, specially designed for use in motor touring, shows the roads with great clearness, and is effectively coloured to show height of land.

ÖSTERREICH-UNGARN.—Flemming's Namentreue idiomatographische Länderkarten, Blatt. 4. In flächentreuer Kegelrumpfprojection mit 2 abweitungstreuen Parallelkreisen. Mittlerer Massstab, 1 : 1,500,000. Herausgegeben von Prof. Dr. A. Bludau und Otto Kerkt. Price M. 3.50.

Carl Flemming, Berlin and Glogau.

Austria-Hungary is the latest addition to this valuable series of new maps, and admirably illustrates the method of treatment ; all the Austrian names are in German and the Hungarian names in Magyar.

TURKEY.—General Staff Map on scale of 1 : 250,000 or about four miles to an inch. Sheet Gumuljina. 1910. Price 2s. 6d.

Geographical Section, General Staff, London.

AMERICA.

ONTARIO.—Topographic Map. Scale 1 : 63,360 or 1 mile to an inch. Contours at intervals of 25 feet. Sheets—No. 3, Niagara ; No. 30, Simcoe. (Department of Militia and Defence, Ottawa, 1909.)

Geographical Section, General Staff, London.

QUEBEC.—Topographic Map. Scale 1 : 63,360 or 1 mile to an inch. Contours at intervals of 25 feet. Sheet No. 27, Lacolle. (Department of Militia and Defence, Ottawa, 1909.) *Geographical Section, General Staff, London.*

AUSTRALASIA.

AUSTRALIA.—Reduced Survey Map by J. G. Bartholomew. Scale 1 : 6,000,000. 1 sheet. 1910. Price 3s. mounted on cloth.

John Bartholomew and Co., Edinburgh.

A general reference map for travellers and commercial purposes. It is minutely engraved in considerable topographical detail and shows all railways and steamship lines.

GENERAL MAPS.

THE OXFORD WALL MAPS.—Edited by A. J. Herbertson, M.A., Professor of Geography in the University of Oxford. Drawn by B. V. Darbishire, M.A., Trinity College, Oxford.

THE BRITISH ISLES.—Physical Features with Railway and Steamer Routes. Scale 1 : 1,000,000 or 16 miles to an inch. Size 60 × 40. Price 8s. 6d. mounted on cloth to fold.

NORTH AMERICA.—A series of five wall maps, each on scale 1 : 7,500,000 or 120 miles to an inch. Size 60 × 40.

1. Physical Features without Names.
2. Physical Features with Physical Names.
3. Physical Features with Political Names.
4. Rainfall.
5. Vegetation.

Price unmounted, 7s. each map.

Henry Frowde, The Oxford University Press Warehouse, London.

This is an entirely new series of School wall maps planned by a practical teacher. No one knows better than Professor Herbertson the requirements of such a series, and it is only fair to say that in respect of scope and thoroughness of treatment nothing so complete has yet been attempted. The series of five North American Maps now before us shows the method of treatment accorded to each of the Continents as well as to the British Isles. From the simple orographical key map without names one is led on to the same map with names of the physical features, then to the political names and boundaries in relation to the same orographical basis, then to the rainfall, and last of all to the vegetation. It only remains to be added that the maps are effectively drawn and produced at a cheap price.

CHART OF THE WORLD.—Bartholomew's Library and Commercial Chart on Mercator's Projection. Size 6 × 4 ft. Coloured politically, and showing railway and steamship routes, telegraph cables, ocean currents, etc. 1910. Price £1, 1s. net. Mounted on cloth, rollers, and varnished, or dissected, mounted on cloth and in case.

John Bartholomew and Co., Edinburgh.

This new map is designed as a library or office reference chart. It shows all the features required in connection with world travel. With regard to ocean routes and international railways it appears to be very complete and up-to-date.

NEW ATLASES.

ATLAS UNIVERSEL DE GÉOGRAPHIE.—Commencé par M. Vivien de Saint-Martin et continué par Fr. Schrader. No. 62—Maroc. Price 2 fr.

Librairie Macbeth et Cie, Paris.

An excellent map of Morocco compiled from the latest material on the scale of 1 : 2,500,000.

STATISTICAL ATLAS OF CHRISTIAN MISSIONS. Containing a Directory of Missionary Societies, a Classified Summary of Statistics, an Index of Mission Stations, and a Series of Specially Prepared Maps of Mission Fields. Price 10s. 6d. *World Missionary Conference*, 1910, *Edinburgh.*

Dr. John R. Mott, in his preface to this atlas, explains that it is part of the Report of Commission I, "On Carrying the Gospel to all the Non-Christian World." It embodies a series of twenty one-ft. folio maps, showing mission stations throughout the world, with very complete statistical text, and is the most comprehensive atlas of the kind yet published. The maps are edited by Prof. Harlan P. Beach of Yale University and executed by Messrs. Bartholomew of the Edinburgh Geographical Institute.

GRAPHIC ATLAS OF THE WORLD.—A Series of 128 Maps and Plans, with General Index. Edited by J. G. Bartholomew, LL.D., F.R.G.S. 1910. Size, cr. 4to. Price 5s. net. bound in cloth.

John Walker and Co., London.

A popular atlas designed for general reference. It is very comprehensive and complete, considering its handy size.

PHILIP'S PICTORIAL POCKET ATLAS AND GAZETTEER. One hundred and forty-eight pages of Maps, Pictures, and Statistical Diagrams with Gazetteer Index of 18,000 names. 1910. Price 1s. net.

George Philip and Son, Ltd., London.

A neat and attractive little volume of maps and pictures, with diagrammatic statistics and reference gazetteer.

PHILIP'S ELEMENTARY ATLAS OF COMPARATIVE GEOGRAPHY.—A Series of 14 coloured plates with Index. Edited by George Philip, F.R.G.S. South-East of Scotland Edition. Price 1s. net.

PHILIP'S MODEL ATLAS.—Fifty Maps and Diagrams in colour. South-Eastern Scotland Edition. Price 6d. net.

PHILIP'S MODEL ATLAS.—Fifty Maps and Diagrams in colour. South-Western Scotland Edition. Price 6d. net.

George Philip and Son, Ltd., London.

These are special issues of Philip's well-known school atlases. Two are designed for use in South-Eastern Scotland and have a special large-scale map of that part of the country ; the other is similarly equipped for South-Western Scotland.

ROYAL SCOTTISH GEOGRAPHICAL SOCIETY.

REPORT OF COUNCIL.

Twenty-Sixth Session, 1909-1910.

The Council has the honour to submit the following Report :—

Patronage of the King.

His Majesty King George v. graciously consented to become patron of the Society, in succession to King Edward.

The Retiring President.

The Society desires to express its regret at the retirement of Professor Geikie, D.C.L., LL.D., F.R.S., from the presidency, and to tender to him its cordial thanks for his services as President during the past six years.

Ordinary Membership.

The changes which occurred during the Session in the number of members were as follows :—

Number on 1st November 1909,		1746
New Members added,		598
		2344
Deduct by Death,	35	
,, Resignation,	182	
		217
Number of ordinary members remaining on roll on 31st October 1910,		2127

Of this number, 1115 are on the Edinburgh list, 559 are on the Glasgow list, 164 and 140 are on the Dundee and Aberdeen lists respectively. In addition to those on the lists named, 48 members reside abroad, and 101 reside in England. Of the total number of 2127 members, 233 are life members.

Teacher Associate Members.

Number on 1st November 1909,	54
New members added,	132
	186
Deduct by Resignations,	31
	155

Meetings of the Society.

The Society's Anniversary Meeting was addressed by Sir Ernest H. Shackleton, C.V.O., F.R.S.G.S. Thirty ordinary meetings were held, eight in Edinburgh, eight in Glasgow, seven in Dundee, and seven in Aberdeen. These meetings

were addressed by Admiral Sir Charles Campbell, K.C.M.G., C.B., D.S.O.; William Hunter Workman, M.A., M.D., and Mrs. Bullock Workman, F.R.S.G.S. ; M. Aurel Stein, Ph.D. ; Prof. John L. Myres, F.S.A. ; Mrs. Gabrielle M. Vassal ; Vaughan Cornish, D.Sc., F.R.G.S. F.G.S. ; W. S. Bruce, LL.D. ; Commander R. E. Peary, LL.D. ; H. Hesketh Prichard, F.R.G.S., F.Z.S. ; Miss M. I. Newbigin, D.Sc. ; and Prof. J. Arthur Thomson, M.A.

Medals Awarded.

The Livingstone Gold Medal of the Society for 1909 was awarded to Sir Ernest Shackleton, C.V.O., in recognition of his Antarctic Explorations.

The Society's Silver Medal was conferred on the following members of Sir Ernest Shackleton's scientific staff:—Lieutenant Jameson B. Adams, R.N.R., Dr. Eric P. Marshall, and Mr. F. Wyld.

On the occasion of his lecture in Edinburgh Commander Peary, already the recipient of the Livingstone and the Society's Gold Medals, was presented by the Society with a silver model of a ship representing a three-masted vessel of the late sixteenth-century type, in full sail.

University Medal.

Two essays were received for the medal offered by the Society in connection with the Lectureship in Geography at Edinburgh University, one from Miss Alice B. Lennie, M.A., B.Sc., on the County of Sutherland, and the other from Mr. Charles Matheson, M.A., on the Counties of Elgin and Nairn. Both essays were very good, but the medal has been awarded to Miss Lennie.

Diploma of Fellowship.

The Honorary Diploma was conferred on Dr. M. Aurel Stein in recognition of his Geographical and Archæological explorations in Central Asia.

The ordinary Diploma of Fellowship was awarded to A. W. Andrews, B.A., Oxon., J. Hamilton Birrell, M.A., Edin., J. Mathieson, and George M. Richmond, members of the Society.

Appointment of New Secretary.

Mr. George G. Chisholm, M.A. B.Sc., Lecturer in Geography at the University of Edinburgh, was appointed Secretary of the Society, in the place of Major W. Lachlan Forbes, who resigned.

Entrance Fee.

An entrance fee of one guinea was re-imposed on all Ordinary Members joining the Society.

The Society's Magazine.

The *Scottish Geographical Magazine* has, as usual, been published throughout the past Session monthly, with maps and illustrations.

The Council is glad to acknowledge its obligations to the contributors of articles, and to the following gentlemen who have rendered valuable assistance to the editors :—Dr. J. G. Bartholomew ; Dr. R. N. Rudmose Brown ; Mr. C. G. Cash ; Mr. Geo. G. Chisholm ; Mr. James Cossar ; Dr. G. Cumming ; Mr. A. L. Cross ; Rev. A. K. Dallas ; Mr. H. B. Finlay ; Dr. John Gunn ; Mr. H. B. Harvey ; Mr. Lionel Hinxman ; Dr. C. G. Knott ; Mr. James Macdonald ; Rev. R. Mackenzie ; Mr. F. J. Martin ; Mr. James Moncur ; Mr. J. D. Monro ; Mr. T

S. Muir; Mr. Ralph Richardson; Dr. J. S. Shand; Dr. W. G. Smith; Mr. William Stanford; Mr. C. W. A. Tait; Mr. W. A. Taylor; Mr. E. M. Wedderburn; Dr. J. H. Wigner; Mr. W. B. Wilson.

Library and Map Department.

During the past session 289 books, 55 pamphlets, 278 reports, 9 atlases, 361 map-sheets and charts have been added to the library. The number of volumes borrowed by members was 3804, and the library was, as usual, much consulted by non-members in search of geographical information.

The Council desires to record its thanks to foreign and colonial governments for the official publications they have presented to the library; to the Treasury, for the revised Ordnance Survey Maps of Scotland, both in outline and colour, as each of the revisions now in progress is published, and also to the undermentioned private donors of books and maps, viz.:—Prof. James Geikie, LL.D.; Miss E. G. Kemp, F.R.S.G.S.; Mr. Ralph Richardson, F.R.S.E.; Mrs. Fanny Bullock Workman; Captain A. Akin-Higgins; Dr. William Hunter Workman; Mr. P. M. Macintyre, LL.B.; Principal Robert Chodat; Sir John Murray, K.C.B.; Dr. George Bryce; Miss M. I. Newbigin, D.Sc.; Dr. W. S. Bruce; Mrs. Keith Young; Prof. G. Ishibashi; Mrs. Hugh Rose; and Sir Charles Bruce, G.C.M.G.

Glasgow, Dundee, and Aberdeen Centres.

The Council has again the pleasure to acknowledge the services rendered by the honorary officials of the Glasgow, Dundee, and Aberdeen centres for their continued successful conduct of the business of the Society.

Finance.

The Council begs to submit the Annual Financial Statement.

ABSTRACT OF THE ACCOUNTS OF THE ROYAL SCOTTISH GEOGRAPHICAL SOCIETY

From 31st October 1909 to 31st October 1910.

Funds at Close of last Account:—			
£1000 Glasgow and South-Western Railway Company 4 per cent. Funded Debt, at cost price, as at 29th May 1885,		£1102	19 9
£533, 6s. 8d. North British Railway Company 3 per cent. Consolidated Lien Stock, at cost price, as at 30th December 1890,		496	2 0
£200 Great Central Railway Company 4½ per cent. Debenture Stock, at cost price, as at 31st December 1898,		312	2 9
£240 North British Railway Company 4 per cent. Consolidated Preference Stock, at cost price, as at 11th December 1902,		306	8 9
		£2217	13 3
Balances due by Bank:—			
1. Bank of Scotland—			
1. On Account Current,	£61 19 6		
2. Do. Deposit Receipt,	4 19 5		
3. Do. do. (Glasgow Equipment Fund)	59 3 3		
		126	2 2
2. Commercial Bank—			
On Account Current,		169	2 9
Balance due by Secretary,		1	11 5
Payments in connection with "Quarterly Geography" (recovered in 1909-10),		35	1 6
		£2549	11 1
Less—			
Balance due to Livingstone Fund,		30	15 8
		£2518	15 5
Subscriptions from Ordinary Members, £2641 7 0			
Less—			
Applicable to Session 1910-11, 44 7 6			
	£2596 13 6		
Do. Life Members,	20 0 0		
Do. Associate Members,	84 7 6		
Entrance Fees,	7 7 0		
Dividends and Interest,	86 0 6		
Government Grant,	200 0 0		
Miscellaneous—Income Tax recovered	7 19 3		
Entrance Fees from new Members,	23 2 0		
		2426	1 3
		£4944	16 8

Magazine—Expenses of Publication, etc., for Nos. 11 and 12 of Vol. XXV., and Nos. 1 to 10 of Vol. XXVI.:—			
Printing and other charges,		£649	17 2
Illustrations,		27	18 0
Maps,		28	10 0
		£706	5 2
Less—			
Magazines sold,	£58 13 2		
Advertising Receipts, less Payments,	79 16 6		
		138	9 8
		£567	15 6
General Printing,		42	15 0
Books and other furnishings for Library,		41	16 3
Rent of Hall, and other expenses of Lectures—*Less* Tickets sold,		616	0 10
Glasgow Branch, Rent of Hall,		15	0 0
Rent of Council Room, Taxes, Gas, Repairs, Insurance, etc.,		235	18 3
Salaries,		533	18 1
Miscellaneous, including Stationery, General Expenses, and Postages,		197	4 3
Medals,		4	19 0
Presentation to Commander Peary and late Hon. Sec. at Glasgow,		99	14 0
Furnishings at new Rooms,		26	19 0
		£2377	0 5
Funds at Close of this Account:—			
£1000 Glasgow and South-Western Railway Company 4 per cent. Funded Debt, at cost price, as at 29th May 1885,		£1102	19 9
£533, 6s. 8d. North British Railway Company 3 per cent. Consolidated Lien Stock, at cost price, as at 30th December 1890,		496	2 0
£200 Great Central Railway Company 4½ per. Debenture Stock, at cost price, as at 31st Dec. 1898,		312	2 9
£240 North British Railway Company 4 per cent. Consolidated Preference Stock, at cost price, as at 11th December 1902,		306	8 9
		£2217	13 3
Balances due by Bank:—			
On Account Current,	£27 6 11		
On Deposit Receipt,	304 19 5		
On do. do. (Glasg. Equipment Fund),	60 19 7		
		393	5 11
Balance due by Treasurer,		0	19 1
		£2611	18 3
Less—Subscriptions received applicable to Session 1910-11,		43	2 0
		2567	16 3
		£4944	16 8

Edinburgh, 3rd November 1910.—I have examined the Accounts of the Royal Scottish Geographical Society for the year ending 31st October 1910, of which the above

LIVINGSTONE MEDAL FUND.

FUNDS AT CLOSE OF LAST ACCOUNT:—			
£770 North British Railway Company 4 per cent. Preference Stock No. 1, at cost price,		£999 11	6
Balance due by General Fund,		30 15	8
		£1030 7	2
Income received—			
Dividend on £770 North British Railway Company 4 per cent. Preference Stock No. 1—			
For half-year to 31st January 1910, £15, 8s., less tax, 18s. 2d.,	£14 9 10		
For half-year to 31st July 1910, £15, 8s., less tax, 18s. 2d.,	14 9 10		
	28 19	8	
Income Tax recovered,	3 5	9	
	£1062 12	7	

Paid Messrs. Alex. Kirkwood and Son for Medal,	£30 0	0
Funds at close of this Account—		
£770 North British Railway Company 4 per cent. Preference Stock No. 1, at cost price, £999 11 6		
Deposit Receipt with the Commercial Bank of Scotland, 33 1 1		
	1032 12	7
	£1062 12	7

Edinburgh, 3rd November 1910.—Examined and found correct.

P. C. ROBERTSON, M.A., C.A., Auditor.

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